Benchmarking and Organizational Sustainability of Petroleum Tank Farms in South South, Nigeria

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Abstract: The study assessed the relationship between benchmarking and organizational sustainability (measured by economic sustainability and social sustainability) of petroleum tank farms in South-South, Nigeria. The moral responsibility theory of corporate sustainability and the theory of Technology-Organization-Environment underpinned the study. The epistemological posture of positivism, underpinned the study. The study adopted the cross-sectional survey research design as the variables were not under researcher's control. The instrument for data collection was the questionnaire and the accessible population is 820 middle and top level managers of petroleum tank farms. An adjusted sample size of 288 was determined using the Krejcie & Morgan's formula and the simple random sampling was deployed. Inferential statistics involves the use of Structural Equation Modeling to test the hypotheses at 0.05 significance level. The results revealed that benchmarking has positive and significant relationships with the measures of organizational sustainability.The finding of this study validates the moral responsibility theory of corporate sustainability and the theory of Technology-Organization-Environment, by capturing the structural fitness between benchmarking and the measures of organizational sustainability. Therefore, it is recommended that Managers of petroleum tank farms should improve their level of benchmarking of best practices by effectively and actively encouraging employees to learn from the experience and expertise of other colleagues and organizations through comparing practices and processes and performance levels of their processes/activities with other organizations.

Keywords: Benchmarking; Organizational Sustainability; Petroleum Tank Farms; Economic Sustainability; Social Sustainability.

1. Introduction

Petroleum tank farms are critical investments in the down-stream oil and gas sector. In Nigeria, the oil and gas sector accounts for almost 95% of foreign exchange earnings, and about 65% of government budgetary revenues (Ewubare & Kakain, 2017). However, petroleum tank farms have been grossly affected by the downturn in the economy and are faced with sustainability related challenges. The imperative of organizational sustainability, especially as it relates to petroleum tank farms, cannot be overstressed. Along this line, Ballinger (2011) noted that organizational sustainability enables companies to: better withstand the pressures of globalization; limit corporate scandals; provide a panacea to the global economic crisis and to answer the calls for greater scrutiny of business by external stakeholders. Furthermore, Kielstra (2008) posited that the emergence of

globalization justifies sustainability initiatives, and this has indeed, considerably changed the roles and relationships of governments, business enterprises and other stakeholders.

As such, organizational sustainability is in the base of the relational structure of cultural systems (Lavanderos & Fiol, 2010). As argued by Munck and Souza (2009), organizational sustainability is a state in which an organization adequately relates with the economic, social as well as environmental aspects of their operations. This study adopts economic sustainability and social sustainability as measures of organizational sustainability, from the suggestions of Cella-De-Oliveira (2013). Economic sustainability implies a system of production that satisfies present consumption levels without compromising future needs (Basiago, 1999). More-so, economic sustainability refers to the maintenance of the present well-being by paying attention to inter-temporal distributional equity, dynamic efficiency and international equity (Stavins, Wagner and Wagner, 2003). On the other hand, social sustainability refers to the societal realities which are created through the dynamic interaction of individual values and notions for any particular society (Edum-Fotwe & Price, 2009).

The huge exchange rate differentials between the Nigerian Naira and the United States Dollars, has placed substantial economic burden on operators of petroleum tank farms. The has made all the unregulated petroleum products in Nigeria like AGO, DPK, LPG, ATK, Butimen, LPFO, HPFO and lube to be very expensive to buy (where PMS = prime motor spirit; DPK = dual purpose kerosine; ATK= aviation tubine kerosine (jet-A1); LPG= low pour gas; LPFO= low pour fuel oil; HPFO = high pour fuel oil; AGO = automotive gas oil). The economic burden arising from the exchange rate differentials grossly affects the economic sustainability of petroleum tank farms. Indeed, the social dislocations arising from the impacts of petroleum tank farm operations include: road damages by trucks and other heavy equipment, accidents and traffic delays from increased truck traffic on local roads; company-community conflicts such as vandalization and kidnapping; injury/loss of life from work place hazards as well as accidents.

One the other hand, benchmarking is a continuous, systematic process for evaluating the products, services and work processes with those recognized as representing the best practices, for the purpose of organizational improvement (Brah, Ong & Rao, 2000). According to Lee (2004), benchmarking is an activity which organizations use for discovering best practices and to establish a leadership position. Similarly, Long (2005) argued that benchmarking helps to improve the organization's effectiveness and make the changes required to be the world-class organization or industry leader (Long, 2005). Several scholars have attempted to proffer solutions to the problem of inadequate organizational sustainability. For instance, Maggi (2006) suggested management competences, Chen and Uzelac (2015) recommended product differentiation, Biggemann, Williams, and Kro (2014) mentioned competitiveness, while Ross (2017) argued that adequate regulations is a panacea to the problem of inadequate organizational sustainability. However, despite the several works on organizational sustainability, studies that have considered the context of benchmarking as a predictor, are scant. Therefore, this study seeks to close the lacuna in literature by critically assessing benchmarking and how it relates to organizational sustainability of petroleum tank farms in South South, Nigeria.

1.1 Objectives and hypotheses

The aim of this study is to investigate the relationship between benchmarking and organizational sustainability of petroleum tank farms in South   South, Nigeria. The specific objectives of the study are to:

1. Determine the relationship between benchmarking and economic sustainability.

2. Assess the link between benchmarking and social sustainability.

The following research questions directed the investigation:

i.   What is the relationship between benchmarking and economic sustainability?

ii.   What is the link between benchmarking and social sustainability?

Therefore, the following null hypotheses were formulated to answers the above research questions:

H_{01}:   There is no significant relationship between benchmarking and economic sustainability.

H_{02}:   There is no significant relationship between benchmarking and social sustainability.

1. LITERATURE REVIEW

1. Theoretical framework:

The underpinning theories for this study are the theory of technology-organization-environment- T-O-E Framework (Tornatzky & Fleischer, 1990) and the moral responsibility theory of corporate sustainability (Ha-Brookshire, 2017). The T-O-E framework which was propounded by Tornatzky and Fleischer (1990), is a classic framework that proposes a generic set of factors that explain and predict the likelihood of innovation/technology adoption. The T-O-E framework proposes three bits of enterprise contexts that influence the adoption and/or implementation of innovations. The contexts are technology development (Kauffman & Walden, 2001); organizational conditions, business and organizational reconfiguration (Chatterjee, Grewal, & Sambamurthy, 2002); and industry environment (Kowath & Choon, 2001). T-O-E integrates the constructs of technology, organization and environment (Gangwar, Date, & Raoot, 2014). Awa, Ukoha & Emecheta (2016) argued that technology describes adoption in terms of the pool of technologies internal and external to the firm as well as their perceived usefulness, technical and organizational compatibility, complexity and learning curve, and visibility/imagination.

The organization captures descriptive measures such as firm's business scope, top management support, organizational culture, complexity of managerial structure measured by centralization, formalization, and vertical differentiation, the quality of human capital, and size and size-related issues such as internal slack resources and specialization (Tornatzky & Fleischer, 1990; Awa, Ukoha & Emecheta, 2016). On the other hand, environmental context relates to the operational facilitators and inhibitors; significant among them are competitive pressure, trading partners' readiness, sociocultural issues, government, encouragement, and technology support infrastructures such as access to quality ICT consultants (Awa, Ukoha & Emecheta, 2016). The T-O-E framework is relevant to this study as it explains the adoption in terms of the pool of technologies which are internal and external to the firm, as well as their perceived usefulness, technical and organizational compatibility and complexity.

On the other hand, the moral responsibility theory of corporate sustainability (Ha-Brookshire, 2015) suggests that for corporations to be truly sustainable, individual members of corporations must perceive corporate sustainability as a moral duty to which all others are ascribed in any circumstances and have clear goals/procedures in place to fulfill such duties. The theory is relevant to the study as it aids adoption of sustainability practices in the firm. This creates a moral obligation on each member of the organization to implement organizational sustainability.

2.2 Conceptual framework: Benchmarking was adopted from Abbas (2014), as a single factor, while organizational sustainability was measured by economic sustainability and social sustainability as adopted from Nicolaesal, Alpopi and Zacharia (2015) and Cella-De-Oliveira (2013).

2.2.1 Benchmarking: Benchmarking is a continuous process of evaluating the products, services and work processes with those recognized as representing the best practices, for the purpose of organizational improvement (Brah, Ong & Rao, 2000). According to Cassell, Nadin, and Gray (2001), benchmarking was originally used to compare measures of business or product performance and it has now been considerably extended to business processes. Benchmarking is a way of measuring an organization's strategies and performance against best-in-class companies, both inside and outside the industry (Long, 2005). Long (2005) further argued that the aim of benchmarking is to identify best practices that can be adopted and implemented by the organization with the purpose of improving a company's performance.

2.2.2 Organizational Sustainability: Organizational sustainability involves a business model that creates value consistent with the environmental, economic and social goals of the stakeholders. Sustainability is a state in which an organization or a society exhibits a relation to economic, environmental and social aspects (Munck & Souza, 2009). Therefore, when it is said that an organization or a society is sustainable, it is meant that it holds a certain state of sustainability (Cella-De-Oliveira , 2013). According to Pappenbroock & Österberg (2017), one common characterization of organizational sustainability suggests that it includes three dimensions, namely environmental, social, and economic sustainability, which can be referred to as the triple bottom line of sustainability (Elkington, 1999).

2.2.3 Economic Sustainability: An economic system designed in the light of the concept is one constrained by the requirements of environmental sustainability (Basiago, 1999). Basiago (1999) further argued that organizations do not seek to achieve economic sustainability at the cost of environmental sustainability. A way to implement the principle of economic sustainability in a practical sense is to fashion a method of urban design that meets the urban service needs of the general public, particularly the urban poor, while enhancing the naturalness of the urban environment (Basiago, 1999). Similarly, Abubakar (2014) argued that economic sustainability refers to consumption of resources in an effective way in order to produce long term positive effects though minimizing adverse impacts of resource exploitation.

2.2.4 Social Sustainability: Social sustainability principles reflect the societal realities which are created through the dynamic interaction of individual values and notions for any particular society' (Edum-Fotwe & Price, 2009). According to Colantonio (2008), social sustainability principles are fundamental instruments to measure the progress towards sustainability. For sustainable projects to be socially sustainable, it follows that such projects must deliver healthy living conditions and ultimately improve the quality of life for society (Mak and Peacock, 2011).

2.3 EMPIRICAL REVIEW: The nexus between benchmarking and the measures of organizational sustainability has been considered by a few researchers. Deng, (2015) studied the process of measuring and benchmarking the performance of sustainability development of organizations as a multi-criteria analysis problem and presents an objective approach for solving the problem in a simple manner. An objective approach is developed for benchmarking the sustainability development performance of individual organizations in the context of multi-criteria analysis. The relative importance of the sustainability indicators is determined independent of the subjective preferences of the decision maker using the concept of information entropy. A modified technique for order

preference by similarity to ideal solutions is used for effectively incorporating the objective indicator weights into the process of determining the overall performance of sustainability development of each organization. As a result, an unbiased overall ranking of individual organizations on the performance of their sustainability development was obtained.

The study found that the proposed approach is applicable for measuring and benchmarking the performance of organizational sustainability development through the presentation of an example. This study will be conducted within South South of Nigeria and the structural equations modeling will be utilised to analyse the data. Thus a contextual and methodological gap is revealed. Another angle was by Abazeed (2017) who studied benchmarking culture and its impact on operational performance. The research paper was designed to explore the extent of benchmarking culture in industrial companies and its impact on operational performance. A total of 30 dimensions of benchmarking culture were figured out from the literature. Out of them 10 were regarded as common values among employees based on descriptive statistics. A sample consisting of 50 industrial companies was drawn randomly from Amman and Irbid.

A questionnaire-based survey was conducted to collect data from employees working at these companies. Of the 315 questionnaires distributed to employees, 227 were returned complete and valid. The results indicated that all dimensions of benchmarking culture (prior benchmarking experience behavior of internal analysis behavior of external analysis continuous improvement mentality share of internal opinions searching for internal best practices comparison with a market leader quality policy communication organizational learning team development) had significant and positive influences on operational performance of industrial companies in Jordan. It was also found that benchmarking culture play an important role in performance improvement.

1. Research Methods:

The research design is the cross-sectional survey, with positivism as the underlying philosophical paradigm. This rides on objectivism as the ontological posture, mainly for the fact that the study variables were outside the control of the researcher and data was collected at a single point (Olsen & St. George, 2014). The population of this study comprises all the petroleum tank farms in South South, Nigeria as retrieved from the Department of Petroleum resources (DPR) in Port Harcourt (https://www.dpr.gov.ng). The elements of the accessible population are the 820 middle and top level managers of all the 29 petroleum tank farms owned by members of the Independent Petroleum Products Importers, in South South, Nigeria. Adopting the Krejcie & Morgan's (1970) formula, the sample size was determined to be 262 respondents. However, to make provision for non-responses, outliers and attritions, a 10% adjustment was effected, to bring the adjusted sample size to 288 respondents and the Bowley's proportional sample allocation formula was deployed to achieve the necessary sample spread from each tank farm. In order to ensure that each member of the accessible population has equal chance of being selected, the simple random sampling technique was deployed. Primary data was collected through the use of questionnaire. In all, 230 usable questionnaire were retrieved and analysed. Descriptive statistics involve the use of mean and standard deviation to assess the characteristics of the study variables, while inferential statistics involve the use of the Structural Equation Modelling to test the hypotheses at 0.05 significance level.

Table 1.1: Questionnaire Distribution

Number of Questionnaire Distributed	288	100%
Number of Questionnaire Retrieved	241	83.68%
Number of Usable Questionnaire	230	79.86%

288 copies of the questionnaire were distributed, out of which a total of 241 copies were retrieved, representing 83.68% . Despite the fact that the researcher embarked on several visits, sent emails and made phone calls as reminders, however, 47 copies representing 16.32% were not retrieved. Furthermore, 11 copies, representing 3.82% were not usable due to missing responses. In all, 230 copies of the instrument, representing 79.86% were retrieved and found to be completed and usable.

4.1. Data Presentation: This section presents data with regards to the respondents' responses to the research instrument. The questionnaire were structured according to Likert's 5-point scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly disagree (SD).

4.1.1 Responses on Benchmarking: Data relating to the responses for benchmarking measured on a set of multi-item instrument with 6 indicators each, all scaled on a five points Likert's scales were presented thus: with regards to item one, "our firm actively encourages employees to learn from the experience and expertise of other colleagues and organizations through comparing practices and processes" showed that 24(10.4%) of our respondents strongly agreed; 52(22.6%) agreed, 77(33.5%) were undecided, 50(21.7%) disagreed and 27(11.7%) strongly disagreed. Similarly, for item two which sought to access "our firm compares performance levels of a process/activity with other organizations – therefore, comparing against benchmarks", the responses follow thus: 31(13.5%) of our respondents strongly agreed; 42(18.3%) agreed, 86(37.4%) were undecided, 55(23.9%) disagreed and 16(7.0%) strongly disagreed. Also, for item three which sought to access "we follow a structured process for comparing performance levels and learn why better performers have higher levels of performance and adapt/implement those better practices", the responses showed that 54(23.5%) of our respondents strongly agreed; 57(24.8%) agreed, 73(31.7%) were undecided, 29(12.6%) disagreed and 17(7.4%) strongly disagreed.

Furthermore, with regards to item four, which assessed "in our organizations, better practices that have been identified through benchmarking are communicated to employees", the responses showed that 68(29.6%) of our respondents strongly agreed; 50(21.7%) agreed, 67(29.1%) were undecided, 30(13%) disagreed and 15(6.5%) strongly disagreed. On the other hand, with regards to item five, which examined "our benchmarking project teams usually consist of people from different areas/departments", the responses showed that 49(21.3%) of our respondents strongly agreed; 51(22.2%) agreed, 50(21.7%) were undecided, 41(17.8%) disagreed and 39(17.0%) strongly disagreed. Lastly, with regards to item six, which examined "my management ensures that a benchmarking code of conduct is understood and followed by all employees", the responses showed that 56(24.3%) of our respondents strongly agreed; 73(31.7%) agreed, 58(25.2%) were undecided, 29(12.6%) disagreed and 14(6.1%) strongly disagreed.

4.1.2 Responses on Economic Sustainability:

Data relating to the responses for economic sustainability measured on a set of multi-item instrument with 6 indicators each, all scaled on a five points Likert's scales were presented thus: with regards to item one, "my organization honours the taxes, tributes, fees, and other government contributions that

enhances economic sustainability" showed that 22(9.6%) of our respondents strongly agreed; 52(22.6%) agreed, 77(33.5%) were undecided, 50(21.7%) disagreed and 29(12.6%) strongly disagreed. Similarly, for item two which sought to access "my organization does not practice disloyal competition, trust, monopoly or dumping on economic sustainability issues", the responses follow thus: 31(13.5%) of our respondents strongly agreed; 42(18.3%) agreed, 86(37.4%) were undecided, 55(23.9%) disagreed and 16(7.0%) strongly disagreed. Also, for item three which sought to access "my organization's economic sustainability decisions are taken based on a formal strategic planning that encompasses the organization as a whole, made by professionals", the responses showed that 54(23.5%) of our respondents strongly agreed; 57(24.8%) agreed, 73(31.7%) were undecided, 29(12.6%) disagreed and 17(7.4%) strongly disagreed.

Furthermore, with regards to item four, which assessed "my organization focused on risk management plans and evaluations, with concern of the company's capacity to honour financial commitment with collaborators and shareholders", the responses showed that 68(29.6%) of our respondents strongly agreed; 50(21.7%) agreed, 67(29.1%) were undecided, 30(13%) disagreed and 15(6.5%) strongly disagreed. More-so, with regards to item five, which examined "my company has restructuring plans in case of exceptional events (economic market crash, natural phenomena, etc.)", the responses showed that 49(21.3%) of our respondents strongly agreed; 50(21.7%) agreed, 50(21.7%) were undecided, 41(17.8%) disagreed and 40(17.4%) strongly disagreed. Lastly, with regards to item six, which examined "my organization is punctual in the payment of salaries, benefits, and contracts with suppliers and other partners", the responses showed that 56(24.3%) of our respondents strongly agreed; 73(31.7%) agreed, 58(25.2%) were undecided, 29(12.6%) disagreed and 14(6.1%) strongly disagreed.

4.1.3 Responses on Social Sustainability:

Data relating to the responses for social sustainability measured on a set of multi-item instrument with 6 indicators each, all scaled on a five points Likert's scales were presented thus: with regards to item one, "my organization offers safety conditions and occupational health, minimizing rates of lesions, occupational illness, sick days, days off and deaths related to work" showed that 21(9.1%) of our respondents strongly agreed; 36(15.7%) agreed, 75(32.6%) were undecided, 60(26.1%) disagreed and 38(16.5%) strongly disagreed. Similarly, for item two which sought to access "My organization assists people with special needs, immigrants, minorities, etc.",

the responses follow thus: 40(17.4%) of our respondents strongly agreed; 50(21.7%) agreed, 71(39.9%) were undecided, 46(20%) disagreed and 23(10.0%) strongly disagreed. Also, for item three which sought to access "my organization has a concern with the quality of life of its workers and the society", the responses showed that 35(15.2%) of our respondents strongly agreed; 48(20.9%) agreed, 80(34.8%) were undecided, 40(20.9%) disagreed and 19(8.3%) strongly disagreed. Furthermore, with regards to item four, which assessed "my organization communicates social policies to the society collaborators and disseminated through all hierarchical levels", the responses showed that 32(13.9%) of our respondents strongly agreed; 56(24.3%) agreed, 63(27.4%) were undecided, 55(23.9%) disagreed and 24(10.4%) strongly disagreed.

On the other hand, with regards to item five, which examined "my company offer free training and education to its workers and the society", the responses showed that 37(16.1%) of our respondents strongly agreed; 61(26.5%) agreed, 74(32.2%) were undecided, 40(17.4%) disagreed and 18(7.8%) strongly disagreed. Lastly, with regards to item six, which examined "my organization has a friendly

relationship with the stakeholders, without exploiting them, aiming to create lasting partnerships", the responses showed that 23(10%) of our respondents strongly agreed; 61(26.5%) agreed, 81(35.2%) were undecided, 48(20.9%) disagreed and 17(7.4%) strongly disagreed.

4.1.4 Assessment of Non-response Bias:

The returned responses were split into two groups based on the return dates called "early responders" of 45.65% and late responders" of 54.65%, with batch sizes of 105 and 125 respectively. By following Prahinski's (2001) procedure, about 20% of the survey items (14 out of 71) were randomly drawn and an independent sample t-test was conductedon each item (early response n=105, late response n=125) for assessing non-response bias and tested at 0.05% level of significance (2 tailed). From the test results, the Levene's tests criterion for homogeneity of variances (p>0.05), were not significant, as all the p-values were >0.05, with a minimum of 0.179 and maximum of 0.932. Furthermore, an independent sample t-test was conducted to compare all the randomly selected indicators for the two groups-

Early Respondents and Late Respondents: The mean scores ranges from 2.83 to 3.59, with SD ranging from 0.961 to 1.420. The corresponding values for Equal Variance Assumed, p>0.05 as well as the t-values which were all within ± 2, shows that there were no significant differences in the mean scores for Early Respondents and Late Respondents. Therefore, non-response bias was not significant and does not constitute a challenge to the data and the study.

Table 1.2: Reliability Statistics

SN	CONSTRUCT	NO. OF ITEMS	CRONBACH'S ALPHA STATISTICS
1.	Benchmarking	6	0.821
2.	Economic Sustainability	6	0.823
3.	Social Sustainability	6	0.939

Source: Researcher's Desk, SPSS 25.0 Outputs 2021.

The dataset was tested for reliability with 0.7 and above taken as the Cronbach's alpha cut-off point, as recommended by Nunnally and Bernstein, (1994). The following were the alpha values. Benchmarking (0.821); Economic sustainability (0.823); Social sustainability (0.939).

4.1.5 Assessment of Normality:
All the items in the dataset were found to be normally distributed with the skewness in each case in the range of ± 1.0, with standard error of 0.160, and kurtosis values in the range of ± 1.0, with standard error of 0.320, as depicted in Table 1.3, showing the mean, standard deviation, skewness and kurtosis values for each construct. As recommended by George and Mallery (2010), skewness and kurtosis values between -2 and +2 are considered acceptable. Similarly, Tabachnick and Fidell (2007) posited that the normal range for skewness-kurtosis value should be ± 2.58. In tandem with the various recommendations, it is sufficient to assert that the dataset is reasonably normally distributed.

Table 1.3: Normality Statistics

| Descriptive Statistics									
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
BENCHMARKING	230	6	30	19.73	5.267	-.249	.160	-.410	.320
ECONOMIC SUSTAINABILITY	230	6	30	19.69	5.287	-.234	.160	-.439	.320
SOCIAL SUSTAiNABILITY	230	6	30	18.49	6.135	-.014	.160	-.515	.320
Valid N (listwise)	230								

4.1.6 Assessment of Linearity:
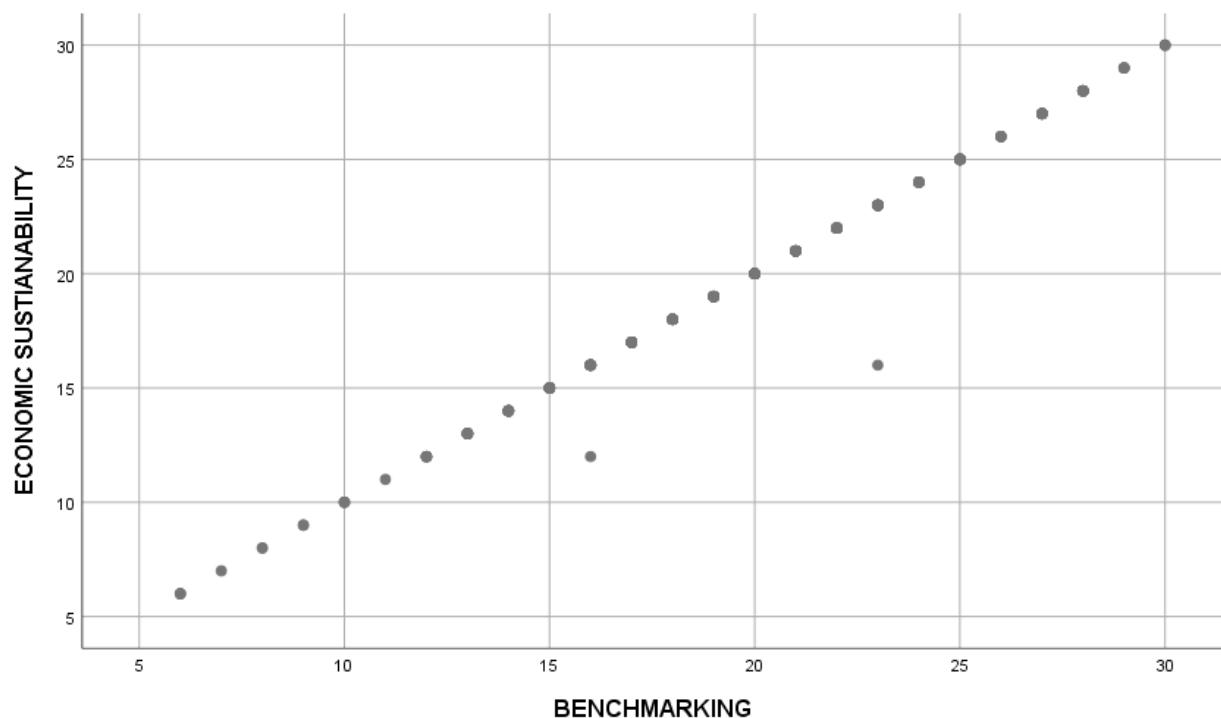
Figure 1.1: Scatterplot for benchmarking and economic sustainability
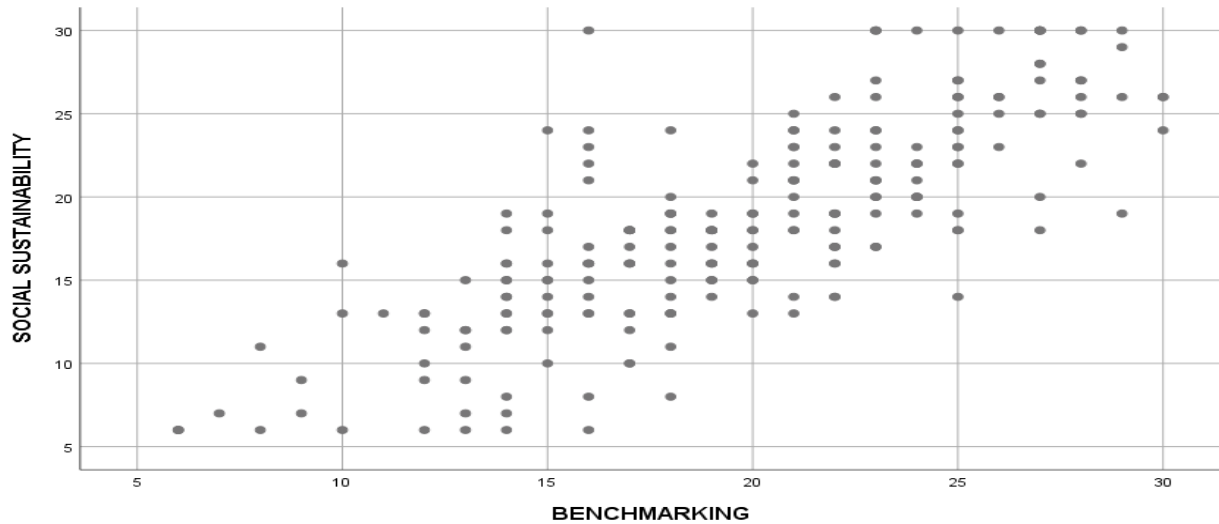
Source : Researcher's data (2021)

Figure 1.2: Scatterplot for benchmarking and social sustainability

Source : Researcher's data (2021).

As suggested by Tabachnick and Fidell (2007), linearity between two variables is assessed roughly by inspection of bivariate scatterplots. In essence, if both variables are normally distributed and linearly related, the scatterplot is approximately oval-shaped, but if one of the variables is non-normal, then the scatterplot between latent constructs is not oval-shaped. The evidence from the scatterplots of all the latent constructs shows that there were indication of curvilinear relationships, thus the assumption of linearity was not violated.

Table 1.4: Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
BENCHMARKING	Based on Mean	1.100	4	225	.358
	Based on Median	1.099	4	225	.358
	Based on Median and with adjusted df	1.099	4	171.148	.359
	Based on trimmed mean	1.032	4	225	.392
ECONOMIC SUSTAINABILITY	Based on Mean	1.139	4	225	.339
	Based on Median	1.142	4	225	.338
	Based on Median and with adjusted df	1.142	4	171.374	.339
	Based on trimmed mean	1.076	4	225	.369
SOCIAL SUSTAINABILITY	Based on Mean	.343	4	225	.849

	Based on Median	.346	4	225	.847
	Based on Median and with adjusted df	.346	4	218.850	.847
	Based on trimmed mean	.358	4	225	.838

4.1.7 Assessment of Homogeneity of Variance: Using Age of Respondents as a categorical variable on the one-way ANOVA, the Levene's test in SPSS 25.0 was used to determine the presence of homogeneity of variance in the data (see Tables 1.4). The results of the ANOVA and Levene's tests revealed that the differences in variances among the latent constructs were not significant (i.e. $p > 0.05$). The results confirm homogeneity of variance in the dataset and suggest that variance for all the constructs within the proposed model were equal within and between groups for the various age groups.

4.2 Measurement Model: The measurement model rides on the common factor model which postulates that every indicator in a set of observable measure is a linear combination of at least one common factor and a unique factor known as the error term. The common factor model is represented by the fundamental equation:

$$y_j = \lambda_{j1}\, \eta_1 + \lambda_{j2}\, \eta_2 + \ldots + \lambda_{jm}\eta_m + \varepsilon_j$$

where y_j represents the j of the p indicators obtained from a sample of n independent subjects, λ_{jm} represents the factor loading relating variable j to the *mth* factor η, and ε_j represents the variance that is unique to indicator y_j and is independent of all η s and all other εs. For the measurement model the suggested goodness of fit indices provided in Hu and Bentler (1999), states that acceptable model fit is defined by the following criteria: RMSEA (≤ 0.6), SRMR (≤ 0.8), CFI (≥ 0.95), TLI (≥ 0.95), GFI (≥ 0.90), NFI (≥ 0.95) PCLOSE (≥ 0.5) and AGFI (≥ 0.90) (Byrne, 2013). Where : RMSEA = Root Mean Squared Error of Approximation, CFI = Comparative Fit Index, TLI = Turker-Lewis index, GFI = Goodness-of-Fit-Index, AGFI = Adjusted Goodness-of-Fit-Index, SRMR = Standardized Root Mean Residual, NFI = Normed Fit Index and PCLOSE = Probability of Close Fit. Furthermore, Carmines and McIver, (1981) suggested that the value of ratio of the χ^2 statistic to its degree of freedom (χ^2/df) , should be less than 5 or preferably less than 3 to indicate an acceptable fit ($\chi^2/df < 5$ preferable < 3). On the other hand, Standardised regression weights should be greater than 0.5 and preferably above 0.7 (Byrne, 2010).
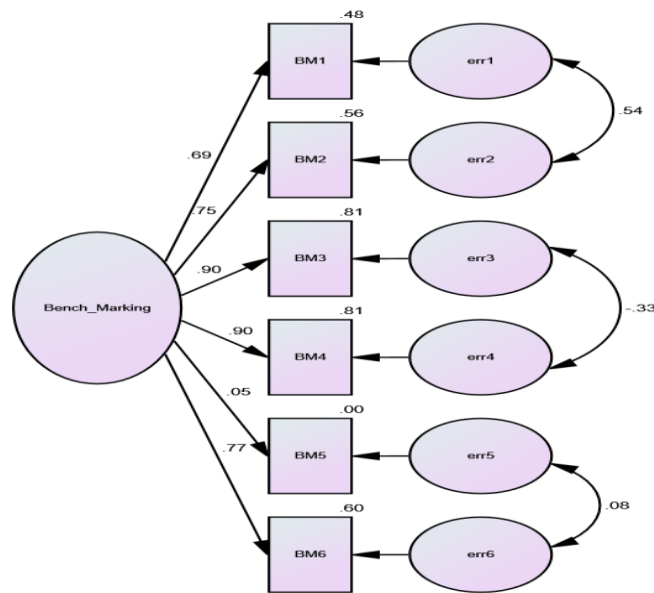
Figure 1.3: Measurement Model of Benchmarking

Table 1.5: Measurement Model Analysis of Benchmarking

Model	Chi-Square(df), Significance	χ²/df	NFI	TLI	CFI	RMSEA	Variable	Factor Loading Estimates	Error VAR
Benchmarking	(9df)=66.751, P=0.000	7.417	0.914	0.874	0.924	0.167	BM1	0.780	0.61
							BM2	0.820	0.67
							BM3	0.863	0.75
							BM4	0.837	0.70
							BM5	0.061	0.00
							BM6	0.768	0.59

Source: Amos 24.0 output on research data, 2021

The results of the goodness of fit indices indicated mediocre fit to the data for one-factor model (chi-square (9df)=66.751, χ²/df=7.417, p=0.000, RMSEA=0.167, CFI=924, NFI=0.914 and TLI=874). Table 1.5 summarized the goodness of fit indices, the factor loading estimates and the error variances. Factor loading estimates revealed that five indicators were strongly related to latent factor -benchmarking - and were statistically significant. The indicators BM1, BM2, BM3, BM4 and BM6 had factor loadings of 0.780, 0.820, 0.863, 0.837, and 0.68 respectively and error variances of 0.48, 0.56, 0.81, 0.81, and 0.60 respectively. However, indicator BM 5 had factor loading of 0.61 and error variance of 0.00. To improve the model, indicator BM5 was deleted and covariances were added between the error terms err1 and err2, err3 and err4, and err5 and err6. After the model modification, the results of the goodness of fit indices indicated acceptable fit to the data for one-factor model (chi-

square (6df)=10.447, χ²/df=1.741, p=0.107, RMSEA=0.057, CFI=994, NFI=0.987 and TLI=985). Apart from BM5, all the other freely estimated standardized parameters were statistically significant. These parameters are consistent with the position that these are reliable indicators of the construct of benchmarking.
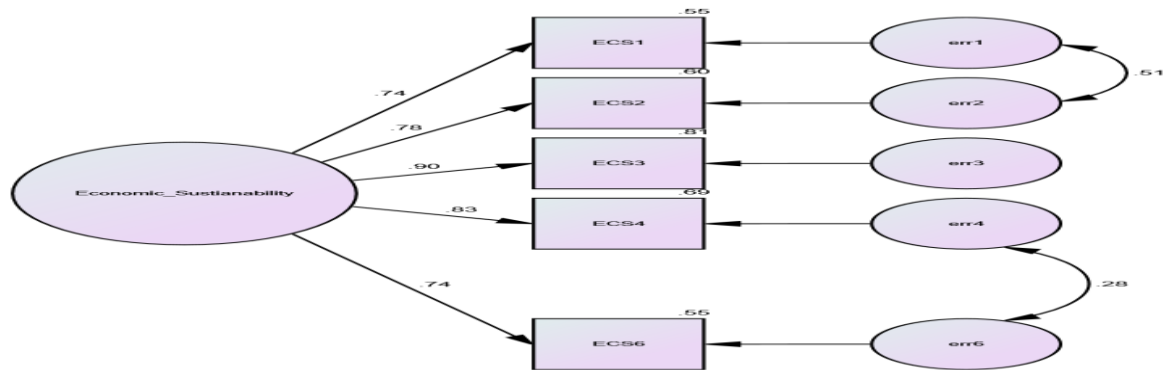

Figure 1.4: Modified Measurement Model of Economic Sustainability

Table 1.6: Modified Measurement Model Analysis of Economic Sustainability

Model	Chi-Square(df), Significance	χ²/df	NFI	TLI	CFI	RMSEA	Variable	Factor Loading Estimates	Error VAR
Economic Sustain-ability	(5df) =67.559 P=0.000	7.504	0.915	0.875	0.925	0.169	ECS1	0.744	0.55
							ECS2	0.776	0.60
							ECS3	0.901	0.81
							ECS4	0.830	0.69
							ECS5	deleted	-
							ECS6	0.744	0.55

Source: Amos 24.0 output on research data, 2021

The results of the goodness of fit indices indicated mediocre fit to the data for one-factor model (chi-square (9df)=67.559, χ²/df=7.504, p=0.000, RMSEA=0.169, CFI=0.923, NFI=0.998 and TLI=0.875). The indicators ECSL1-CL6 had factor loadings of 0.806, 0.827, 0.863, 0.835, 0.061 and 0.761 respectively and error variances of 0.65, 0.68, 0.74, 0.70, 0.00 and 0.58 respectively. According, indicator ECS5 was deleted because of weak loading. After addition of a covariance between the error terms for ECS4 and ECS6, the result indicated improved fit of the first order measurement model (chi-square (3df)=1.435, RMSEA=0.000, CFI=1.000, NFI=0.998, and TLI=1.007) (see figure 1.4 and table 1.6. The improved estimates (0.744, 0.776, 0.901, 0.830 and 0.744) revealed that the five indicators were related to latent factor -economic sustainability- and were statistically significant.

Figure 1.5: Modified Measurement Model of Social Sustainability

Table 1.7: Modified Measurement Model Analysis of Social Sustainability

Model	Chi-Square(df), Significance	χ^2/df	NFI	TLI	CFI	RMSEA	Variable	Factor Loading Estimates	Error VAR
Social Sustain-ability	(9df) =41.085 P=0.000	4.565	0.965	0.954	0.973	0.125	SS1	0.848	0.72
							SS2	0.870	0.76
							SS3	0.860	0.74
							SS4	0.921	0.85
							SS5	0.819	0.67
							SS6	0.770	0.59

Source: Amos 24.0 output on research data, 2021

The results of the goodness of fit indices indicated an acceptable fit to the data for one-factor model (chi-square (9df)=41.085, χ^2/df=4.565, p=0.000, RMSEA=0.125, CFI=0.973, NFI=0.965 and TLI=0.954). Factor loading estimates revealed that the six indicators were related to latent factor - social sustainability- and were statistically significant. The indicators SS1-SS6 had factor loadings of 0.848, 0.870, 0.860, 0.921, O.819 and 0.770 respectively and error variances of 0.72, 0.76, 0.74, 0.85, 0.67 and 0.59 respectively. All freely estimated standardized parameters were statistically significant. These parameters are consistent with the position that these are reliable indicators of the construct of social sustainability.

Table 1.8 : Correlations andAverage Variance Extracted

Variable		BM				ECS	SS		AVE	Sq. Root of AVE
BM		**1.0**				0.795	0.793		**0.650**	**0.806**
ECS		0.795				**1.0**	0.788		**0.642**	**0.801**
SS		0.793				0.788	**1.0**		**0.723**	**0.850**
	Where: BM=Benchmarking, ECS= Economic Sustainability, SS=Social Sustainability, AVE= average variance extracted, Sq. Root of AVE= square root of average variance extracted. Correlation is significant at the 0.01 level (2-tailed).									

Source: SPSS 25.0 and Amos 24.0 output on research data, 2021

4.2.1 Convergent Validity: As revealed in Tables 1.8, all the latent constructs have average variance extracted (AVE) values exceeding the 0.50 threshold and all the degrees of freedom, are greater than zero, thus, all the models are over-identified. As recommended by Fornell and Larcker (1981), with the AVE>0.5 and the standardised estimates >0.7, the model has shown evidence of convergent validity.

4.2.2 Discriminant Validity: The square roots of AVE of each construct are greater than the construct correlations. In consonance with the Fornell and Larcker's (1981) criterion, it is sufficient to assert that the model has evidence of discriminant validity.

4.3 Structural Model: Adopting the reflective, and reclusive model, the relationships between constructs are specified after the transition from the measurement model to the structural model.
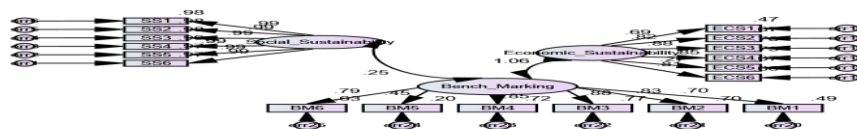

Figure 1.6 Structural model (linking the hypotheses)

Table 1.9 : Test of Hypothesis

S/N	Mediation Stage	Hypotheses	Standardised Estimate (Beta value) > 0.5; or ≥ 0.7	Critical Ratio (C.R) the t-value) ≥ 1.96	P-value < 0.05	Remark	Decision
1	BM →ECS (Hypothesis 5)	There is no significant relationship between benchmarking and economic sustainability.	0.603	2.711	0.000	Positive and Significant	Not supported
2	BM →SS (Hypothesis 6)	There is no significant relationship between benchmarking and social sustainability.	0.813	4.532	0.000	Positive and Significant	Not supported

4.4 Interpretation of Results (Inferential Analysis): The first hypothesis (Ho:1), states that there is no significant relationship between benchmarking and economic sustainability. However, table 1.9

suggests that benchmarking has a positive and significant relationship with economic sustainability of petroleum tank farms in South-South Nigeria (β=0.603, C.R=2.711, p=0.000). Thus, Ho:$_1$was not supported and the alternate hypothesis is hereby accepted. This means that the presence of benchmarking, in petroleum tank farms in South-South Nigeria, will lead to economic sustainability among the petroleum tank farms. Statistically, it shows that when benchmarking goes up by 1 standard deviation, economic sustainability goes up by 0.603 standard deviation. In other words, when economic sustainabilitygoes up by 1 std, benchmarking goes up by 2.711 std. The regression weight for benchmarking in the prediction of economic sustainability is significantly different from zero at the 0.05 level of significance (two-tailed). The second hypothesis (Ho:2), states that there is no significant relationship between benchmarking and social sustainability. However, table 1.9 also suggests that benchmarking has a positive and significant relationship with social sustainability of petroleum tank farms in South-South Nigeria (β=0.813, C.R=4.532, p=0.000). Therefore, Ho:$_2$ was not supported and the alternate hypothesis is hereby accepted. Thismeans that benchmarking is a good predictor of social sustainability of petroleum tank farms in South-South Nigeria.

Statistically, it shows that when benchmarking goes up by 1 standard deviation, social sustainability goes up by 0.813 standard deviation. In other words, when social sustainability goes up by 1 std, benchmarking goes up by 4.532 std. The regression weight for benchmarking in the prediction of social sustainability is significantly different from zero at the 0.05 level of significance (two-tailed). These outcomes present benchmarking as a significant predictor and antecedent of organizational sustainability of petroleum tank farms in South-South Nigeria. Thus the two null hypothetical statements of no significant relationships between benchmarking and the measures of organizational sustainability are rejected based on the lack of statistical evidence to show otherwise. Thus, the findings show as follows: (i)Benchmarking ensures that petroleum tank farms maintain economic sustainability and continue to remain viable. (ii) Ensuring benchmarking of petroleum tank farms will lead to social sustainability and as such, the tank farm operators will be able to meet the social contracts with the both the employees and the society at large.

1.5   Discussion of Findings: The purpose of the study is to assess the link between benchmarking and organizational sustainability (measured by economic sustainability and social sustainability) of petroleum tank farms in South South, Nigeria. The study was underpinned by the moral responsibility theory of corporate sustainability (Ha-Brookshire, 2017) and the theory of technology-organization-environment- T-O-E

Framework (Tornatzky & Fleischer, 1990).

4.5.1 Positive and Significant Relationship between Benchmarking and Economic Sustainability

The first specific objective was to examine the relationship between benchmarking and economic sustainability and was captured by a research question and expressed under Ho:$_1$. This hypothesis stated that there is no significant relationship between benchmarking and economic sustainability. The outcome of the data analysis did not support the hypothesis. The result shows that there is a strong and significant relationship between benchmarking and economic sustainability of petroleum tank farms in South South, Nigeria. This implies increase in benchmarking is associated with increase in economic sustainability. This position is corroborated by Doorasamy (2015) who found that benchmarking enabled managers to evaluate and analyze how much they can save by ensuring that their current technology is functioning according to technological standards and also reduces the amount of waste generated due to technological inefficiency. This study is also in consonance with Adegoke (2018) who found that benchmarking the sustainability performance of Ports is key to

identifying the targets for improvement. Further-still, this finding synchronizes with Simatupang and Widjaja (2012) who found that benchmarking of innovation capability in the digital industry is determined primarily by the quality of human resources who are capable to learn continuously and to follow the changing trend in technology, since their organization structures are not too rigid to avoid complex bureaucracy that can hold up their creativity. This finding further supports the theoretical assertion extracted from the Moral Responsibility Theory of Corporate Sustainability (Ha-Brookshire, 2017) which postulates that for corporations to be truly sustainable, individual members of corporations must perceive corporate sustainability as a moral duty to which all others are ascribed in any circumstances and have clear goals/procedures in place to fulfill such duties.

This finding further validates the theory of Technology-Organization-Environment (T-O-E framework) (Tornatzky & Fleischer, 1990), which postulates that a generic set of factors that explain and predict the likelihood of innovation/technology adoption, are in three bits of enterprise contexts that influence the adoption and/or implementation of innovations. These contexts are technology development (Kauffman & Walden, 2001); organizational conditions, business and organizational reconfiguration (Chatterjee, Grewal, & Sambamurthy, 2002); and industry environment (Kowath & Choon, 2001).

4.5.2 Positive and Significant Relationship between Benchmarking and Social Sustainability

The second specific objective was to determine the relationship between benchmarking and social sustainability and was captured by a research question and expressed under Ho: $_2$ this hypothesis stated there is no significant relationship between benchmarking and social sustainability. The outcome of the data analysis did not support the hypothesis. The result shows that there is a positive and significant relationship between benchmarking and social sustainability of petroleum tank farms in South South, Nigeria. This implies increase in benchmarking is associated with increase in social sustainability. This finding agrees Simatupang and Widjaja (2012) who found that benchmarking of innovation capability in the digital industry is determined primarily by the quality of human resources who are capable to learn continuously and to follow the changing trend in technology, since their organization structures are not too rigid to avoid complex bureaucracy that can hold up their creativity. This position further agrees with Abazeed (2017) who found that benchmarking culture play an important role in performance improvement. This finding further validates the Moral Responsibility Theory of Corporate Sustainability (Ha-Brookshire, 2017) which postulates that for corporations to be truly sustainable, individual members of corporations must perceive corporate sustainability as a moral duty to which all others are ascribed in any circumstances and have clear goals/procedures in place to fulfill such duties.

4.6 Conclusion and Recommendations: This study practically implies that Management of petroleum tank farms should understand how they can boost organizational sustainability by adopting benchmarking. Therefore, it is recommended that Managers of petroleum tank farms should improve their level of benchmarking of best practices by effectively and actively encouraging employees to learn from the experience and expertise of other colleagues and organizations through comparing practices and processes and comparing performance levels of their processes/activities with other organizations.

4.7 Contributions to knowledge: The findings reinforces the theoretical assertions of the Moral Responsibility Theory of Corporate Sustainability (Ha-Brookshire, 2017) and the theory of Technology-Organization-Environment (T-O-E framework) (Tornatzky & Fleischer, 1990), by capturing the structural fitness between benchmarking and the measures of organizational

sustainability. The study's focus on petroleum tank farms, provides a source of enrichment for quality decision making concerning sustainability within the industry.

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