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# Management Control Systems and Organisational Sustainability of Petroleum Tank Farms in South South, Nigeria.

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**ABSTRACT**
The study examined the nexus between management control systems and organisational sustainability (measured by environmental sustainability and economic sustainability) of petroleum tank farms in South-South, Nigeria. The stakeholder theory and the moral responsibility theory of corporate sustainability underpinned the study. The underlying philosophical paradigm is positivism. A cross-sectional survey was adopted and primary data was generated through the use of questionnaire. From a population of 820 middle and top level managers, the Krejcie& Morgan's formula was used to determine an adjusted sample size of 288 respondents. Structural Equation Modelling was deployed to test the hypotheses at 0.05 significance level. The results revealed that management control systems has positive and significant relationships with the measures of organisational sustainability.The findings of this study reinforces the theoretical assertions of the stakeholder theory and the moral responsibility theory of corporate Sustainability, by measuring and validating a model which captures the structural affinity between management control systems and organisational sustainability. Therefore, it is recommended that management of petroleum tank farms should put in place mechanisms to enhance management control systems, by using performance evaluation to provide feedback for learning and continuous improvement, ensuring that formalized performance evaluations are conducted regularly, using predetermined criteria in evaluating and compensating employees performance, having a flexible management control systems package to aid quick response to changes in the markets, rewarding or correcting employees based on rigorous measurements of business performance and using management control systems in order to make decision when encountering problems that are unstructured.

Keywords: Management Control Systems; Organisational Sustainability; Petroleum Tank Farms, Environmental Sustainability, Economic Sustainability.

## I. INTRODUCTION

Nigeria has an economy that is very dependent upon its oil sector. According to Uwakonye, Osho, Anucha and Hyacinth (2006), the oil and gas sector accounts for 95% of Nigeria's foreign exchange earnings, with an estimated oil reserves of between 24 billion and 31.5 billion barrels.There are three main oil and gas markets in Nigeria: an upstream, a midstream and a downstream. Petroleum tank farms are key parts of the downstream oil and gas business and usually consist of: tankage and gantries for the discharge of products into road tankers or other vehicles (such as barges) or pipelines. However, petroleum tank farms face enormous challenges, including those related to general insecurity, inadequate social infrastructure, community agitation, Government underpayment of petroleum subsidies, bribery, corruption, mismanagement, as well as organisational sustainability challenges. The importance of organisational sustainability cannot be over empahsised. Cellade-Oliveira (2013) argued that organizational sustainability balances the economic, environmental and social development, as much as in the internal as in the external sphere of the organization. On the other hand, Eccles, Ioannou and Serafeim (2011) posited that high sustainability companies significantly outperform their counterparts over the long-term, both in terms of stock market and accounting performance. Also, Nidumolu, Prahalad and Rangaswami (2009) noted that by equating sustainability with innovation today, enterprises

can lay the groundwork that will put them in the lead when the recession ends and that there is no alternative to sustainable development.Johansen and Nielsen (2012) argued that sustainability is a type of story-telling that organizations engage in, driven by isomorphic pressures towards the achievement of legitimacy as the key concern. From another perspective, Lavanderos and Fiol (2010) stated that organisational sustainability is an organization's conservative strategy, as a relational system, from structural or configurational changes in the relationships, determined from the culture.Furthermore, several scholars have suggested different measures toconcretize the concept of organisational sustainability. Elkington (1999) advocates that organisational sustainability should not be measured by only economic factors but should be expanded to include organization's environmental and social performance, as well as the financial. This study adapts environmental sustainability and economic sustainability as measures of organisational sustainability as suggested by Cella-De-Oliveira (2013). Notwithstanding the unavoidable uses of petroleum tank farms, these facilities have significant environmental and economic impacts on the society. The major impactsin relation to the operations of the petroleum tank farms include: surface and ground water pollution from leaks, spills and washouts; damage of ecological resources and environmental degradation by oil spills from storage tanks, pipes, and pits; problems of hazardous wastes; noise and vibration from pump operations; road damages, accidents and traffic delays from increased truck traffic on local roads. The second level impact or the manifestation of the problem of inadequate organisational sustainability practices of petroleum tank farms, transcends the individual, the organisation (the tank farms), the communities and the government. According to Akintayo (2017), Nigeria imports about 4.8 billion litres of petroleum products per quarter, and to evacuate these products from the tank farms, about 136,364 tankers, with an average capacity of about 33,000 litres are required to lift the productsto different parts of the country. Similarly, Oluwatuyi, Omotoba andIleri (2013) noted that majority of the causes of petroleum tanker disaster could be traced to the negligence on the part of the drivers, as most of the tanker drivers use drugs, are illiterates, could hardly recognize the road signs, and prefer to travel by night with consequential weariness and tiredness. Several organisational sustainability strategies have been suggested by scholars, to reduce the impact of the operations of petroleum tank farms and their tankers on the society. Akintayo (2018) suggested that there should be improvement on road rehabilitation and proper maintenance of the roads by the agencies responsible, while the petrol tanker drivers should be made to strictly adhere to road signs and signals and drivingunder the influence of drugs or alcohol and at late nights, should be discouraged.

Indeed, other organizational sustainability strategies suggested by researchers include: eco-efficiency (Savitz & Weber, 2007); management competences (Maggi, 2006); competitiveness (Biggemann, Williams & Kro, 2014);product differentiation (Chen & Uzelac, 2015),adequate regulations (Ross, 2017)and protection of the ecosystem (Obradovic-Wochnik & Dodds, 2015).Despite the myriad of possible panaceas put forward by various scholars in tackling the problem of ineffective organisational sustainability, only few studies have considered addressing the problem from the context of management control systems. Moreover, studies that have deployed structural equation modelling (SEM) as a statistical technique to investigate the nexus between management control systems and organisational sustainability are scant. As such,there exist a contextual and methological gap in literature. Therefore, this study seeks to close the lacuna by critically examining management control systems and how it affects organisational sustainability of petroleum tank farms in South South, Nigeria, by means of structural equation modelling as a statistical technique.

### 1.1 Objectives and hypotheses

The aim of this study is to ascertain the link between management control systems and organisational sustainability of petroleum tank farms in South South, Nigeria. The specific objectives of the study are to:

i. Evaluate the relationship between management control systems and environmental sustainability.
ii. Ascertain the link between management control systems and economic sustainability.

The following research questions directed the investigation:

i. What is the association between management control systems and environmental sustainability?
ii. What is the link between management control systems and economic sustainability?

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The following null hypotheses were formulated to provide tentative answers to the above research questions:

**$H_{01}$:** There is no significant relationship between management control systems and environmental sustainability.

**$H_{02}$**: There is no significant relationship between management control systems and economic sustainability.

## II. LITERATURE REVIEW

**2.1 Theoretical framework:** The theories that underpin the study are the stakeholder theory (Freeman, 1984) and the moral responsibility theory of corporate Sustainability (Ha-Brookshire, 2017). The stakeholders theory involves organisational management and ethics and was propunded by Freeman (1984). The theory suggests that a firm depends on and needs to put into consideration, any group or individual who can affect or is affected by the achivement of the firm's objectives. As such, companies needed to understand their relationships with not only traditional groups such as suppliers, customers, and employees, but also non-traditional groups such as government, environmentalists, and special interest groups to manage their organizations more effffectively. The stakeholder theory is relevant to the study, as it provides a useful basis for understanding the value every stakeholder is adding to the firm. On the other hand, the moral responsibility theory of corporate Sustainability (Ha-Brookshire, 2015) 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. Therefore, the moral responsibility theory of corporate Sustainability is relevant to the study because it aids adoption of sustainability practices in the firm. In this sense, every member of the organisation will perceive organisational sustainability as a moral duty.

**2.2 Conceptual framework:** The predictor variable - management control systems was adopted from Willert, Israelsen, Rohde & Toldbod (2017), as a single factor, while the criterion variable- organizational sustainability, was measured by environmental sustainability and economic sustainability, as adopted from Nicolaesal, Alpopi and Zacharia (2015) and Cella-De-Oliveira (2013).

**2.2.1 Management Control Systems:** Management control systems (MCS) is the process by which managers ensure that resources are obtained and effectively and efficiently utilised in the accomplishment of the organization's objectives (Anthony, 2003). The management control systems must have specific characteristics that make them effective, such as the alignment with the strategies and goals of the organization, the compatibility of the organizational structure with the managers' responsibility for decision, and the motivation to achieve the targets associated with the guidelines of the strategic plan (Horngren, Foster & Datar, 2000).

**2.2.2 Organisational Sustainability:** Organisational sustainability encompasses a business model that creates value consistent with the longterm preservation and enhancement of financial, environmental and social capital. Colbert and Kurucz (2007) identified the colloquial definition of sustainability as being to "keep the business going", whilst another frequently used term in this context refers to the "future proofing" of organizations. Similarly, Boudreau and Ramstad (2005) argued that organisational sustainability is the process by which a business enterprise achieves success today without compromising the needs of the future.

**2.2.3 Environmental Sustainability:** Environmental sustainability refers to measures to ensure that the environment is not depleted or damaged further than it has already. This is a particular aspect of the broader sustainable development debate which encompasses a broader range of social economic and environmental goals. Specifically, Morelli (2011) argued that environmental sustainability could be defined as a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the services necessary to meet those needs nor by our actions diminishing biological diversity.

**2.2.4 Economic Sustainability:** Economic sustainability includes the overall set of human activities related to good and service production, distribution and consumption. It redefines the traditional economic concepts, especially needs and satisfiers, material and immaterial, social and individual needs. Economic sustainability refers to consumption of resources in an effective way in order to produce long term positive effects though minimising adverse impacts of resource exploitation (Abubakar, 2014).

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**2.3 EMPIRICAL REVIEW:** The link between management control system and organisational sustainability has been assessed by several scholars, in other contexts. For instance, to vividly contextualise the sustainability argument in the domain of management control systems, Mouton (2017) evaluated the sustainability management control system (SMCS) factors to consider in metric conceptualization. Guided by stakeholder theory, the single case study explored strategies Alberta-based oil sands company leaders use for critical planning, developing, and implementing SMCS performance metrics. The target population comprised of 20 oil sands company leaders from an Alberta, Canada, organization who had experience with sustainability and SMCS performance metrics. Data collection occurred through face-to-face, semistructured interviews. Participant observation and document review were secondary data sources. Data were open coded and organized into categories with supporting software to identify patterns and prevalent themes. Member checking was employed to validate themes and strengthened the trustworthiness of interpretations. Findings suggested the importance of organization strategy and leadership, SMCS maturity development, stakeholder influence, management review, and performance metric definition and data. The study suggested that these key factors could assist oil sands company leaders to influence social change by assuring effective and efficient management control to improve sustainability performance and sustainability strategy integration, reduce operational risk to physical assets, and enhance employee health and safety. The study adopted a qualitative approach of analysis. A quantitative technique of data analysis can be brought in to further validate the postulations. Therefore, a methodological gap is revealed. To cement the sustainability discourse, Ussahawanitchakit (2017) studied management control systems and firm sustainability: The objective of the study is to examine the effects of management control systems on the firm sustainability of textile and apparel businesses in Thailand. Management control systems are the main variable of the study, while organisational renewal, management development, business excellence, and firm sustainability are the outcome variables of the study. 186 textile and apparel businesses in Thailand compose the study sample. A mail survey questionnaire was used for data collection. Additionally, structural equation modelling was utilised to test the research relationships. The study found that management control systems positively impact organisational renewal and firm sustainability. In addition, the study revealed that organisational renewal positively affects management development, business excellence, and firm sustainability. Still, the study found that both management development and business excellence positively influence firm sustainability. To verify and expand the current study, future research needs to collect data from different populations or larger populations and employ other statistical techniques, such as regression analysis, partial least squares, and structural equation modelling to prove the generalisability of the study. Thus, a methodological gap is identified.

## III. RESEARCH METHODS:

The philosophical context of the study, is positivism, which takes an ontologically posture of realism. Therefore, this study utilised a cross-sectional survey research design, on a deductive, descriptive and explanatory basis, in a non-contrived setting, essentially because the researcher could not control or manaipulate the variables and and the study relied on data collected from the respondents at a single point (Olsen & St. George, 2014). The population of this study comprises all the petroleum tank farms in South South, Nigeria. Data retrieved from the Department of Petroleum resources (DPR) in Port Harcourt (https://www.dpr.gov.ng), reveals that there are 124 petroleum tank farms in Nigeria, out of which 37 petroleum tank farms are located in South South, Nigeria. Accordingly, 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. Krejcie& Morgan's (1970) formula was utilised to determine a sample size of 262 respondents, which was adjusted for non-responses and attrition, by 10% to 288 respondents. The Bowley's proportional sample allocation formula was used to get the representative proportionate sample from each tank farm. The simple random sampling was used to ensure that each member of the accessible population has equal chance of being selected. The questionnaire was the source of data collection. However, only 230 usable questionnaire, were retrieved. The hypotheses were tested at 0.05 level of significance, using the Structural Equation Modelling.

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**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% |

As indicated in table 1.1, a total of 288 copies of the instrument were administered, out of which a total of 241 copies were retrieved, representing 83.68% of actual distribution rate. However, 47 copies representing 16.32% were not retrieved, as the concerned respondents could not create time to complete them, despite the fact that the researcher embarked on several visits, sent emails and made phone calls as reminders. Of the 241 copies of the instrument retrieved, 11 copies, representing 3.82% were not usable due to missing responses. In all, due to combined efforts of the researcher and the research assistants, 230 copies of the instrument, representing 79.86% were retrieved and found to be completed and usable.

**Table 1.2: Reliability Statistics**

| SN | CONSTRUCT | NO. OF ITEMS | CRONBACH'S ALPHA STATISTICS |
|---|---|---|---|
| 1. | Management Control Sytems | 7 | 0.928 |
| 2. | Environmental Sustainability | 7 | 0.736 |
| 3. | Social Sustainability | 6 | 0.939 |

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

The instrument was subjected to test of reliability with the following Cronbach's alpha values: management control systems (0.928), environmental sustainability (0.738) and social sustainability (0.939). As recommended by Nunnally and Bernstein, (1994) an alpha value of 0.7 and above indicates reliability of the measured constructs.

**3.1 Assessement of Normality:** George and Mallery (2010), suggested that values of skewness and kurtosis between -2 and +2 are considered acceptable, while Tabachnick and Fidell (2007) noted that the normal range for skewness-kurtosis value should be $\pm$2.58. Following the various recommendations, all the items in the dataset were found to be normally distributed with the skewness in each case in the range of $\pm$1.0, with standard error of 0.160, and kurtosis values in the range of $\pm$1.0, with standard error of 0.320. Table 1.3 shows the mean, standard deviation, skewness and kurtosis values for each construct. This confirms that there was no major issue of non-normality of the data.

**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 |
| MANAGEMENT CONTROL SYSTEMS | 230 | 7 | 35 | 21.87 | 6.702 | .042 | .160 | -.544 | .320 |
| ENVIRONMENTAL SUSTAINABILITY | 230 | 9 | 35 | 20.28 | 5.321 | .160 | .160 | -.457 | .320 |
| ECONOMIC SUSTAINABILITY | 230 | 6 | 30 | 19.69 | 5.287 | -.234 | .160 | -.439 | .320 |

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| | |
|---|---|
| Valid (listwise) | N230 |

**3.2 Assessement of Linearity:** Tabachnick and Fidell (2007) also noted that 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 oval-shaped, but if one of the variables is nonnormal, 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. |
|---|---|---|---|---|---|
| MANAGEMENT CONTROL SYSTEMS | Based on Mean | .244 | 4 | 225 | .913 |
| | Based on Median | .257 | 4 | 225 | .905 |
| | Based on Median and with adjusted df | .257 | 4 | 219.213 | .905 |
| | Based on trimmed mean | .260 | 4 | 225 | .903 |
| ENVIRONMENTAL SUSTAINABILITY | Based on Mean | .537 | 4 | 225 | .709 |
| | Based on Median | .502 | 4 | 225 | .735 |
| | Based on Median and with adjusted df | .502 | 4 | 221.747 | .735 |
| | Based on trimmed mean | .544 | 4 | 225 | .704 |
| 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 |

**3.3 Assessement of Homogeneity of Variance:** In this study, Levene's test in SPSS 25.0 was used to determine the presence of homogeneity of variance in the dataset (see Tables 1.4) using Age of Respondents as a non-metric variable on the one-way ANOVA. The results of the ANOVA and Levene's tests revealed that all of the latent variables were non-significant (i.e. $p>0.05$), thus we have not violated the assumption of homogeneity of variance. The results confirmed the homogeneity of variance in the data and suggest that variance for all the constructs within the proposed model were equal within and between groups for the various age groups.

**3.4 Measurement Model:** The measurement model ( otherwise called Confirmatory Factor Analysis-CFA) rides on the common factor model which 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 the of p indicators obtained from a sample of nindependent subjects, $\lambda_{jm}$represents the factor loading relating variable j to the mth factor ŋ, and $\varepsilon_j$ represents the variance that is unique to indicator $y_j$ and is independent of all ŋ sand all other εs. The measurement model is in two stages : (i) the examination of the goodness of fit indices after the indicators have been loaded into the latent variable, and (ii) the interpretation of the parameter estimates. 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. Moreso, Carmines and McIver, (1981) suggested that the value of ratio of the $\chi^2$ statistic to its degree of freedom ($\chi^2$/df) , should be less than 5 or preferable less than 3 to indicate an acceptable

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fit ( $\chi^2$/df <5 preferable <3 ). In the case of parameter estimates, factor loading (Standardised regression weight) should be greater than 0.5 and preferably above 0.7 (Byrne, 2010).

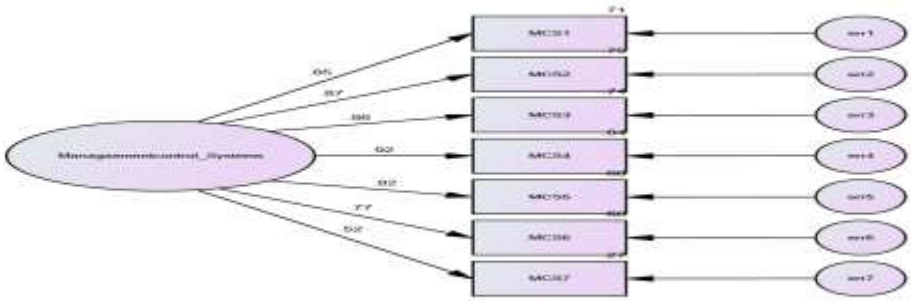

**Figure 1.1: Measurement Model of Management Control Systems**

**Table 1.5: Measurement Model Analysis of Management Control Systems**

| Model | Chi-Square(df), Significance | $\chi^2$/df | NFI | TLI | CFI | RMSEA | Variable | Factor Loading Estimates | Error VAR |
|---|---|---|---|---|---|---|---|---|---|
| Management Control Systems | (14df) =53.515, P=0.000 | 3.822 | 0.958 | 0.952 | 0.968 | 0.111 | MCS1 | 0.845 | 0.71 |
| | | | | | | | MCS2 | 0.869 | 0.75 |
| | | | | | | | MCS3 | 0.862 | 0.74 |
| | | | | | | | MCS4 | 0.918 | 0.84 |
| | | | | | | | MCS5 | 0.823 | 0.68 |
| | | | | | | | MCS6 | 0.774 | 0.69 |
| | | | | | | | MCS7 | 0.519 | 0.27 |

**Source:** Amos 24.0 output on research data, 2021

The results of the goodness of fit indices indicated acceptable fit to the data for one-factor model (chi-square (14df)=53.515, $\chi^2$/df=3.822, p=0.000, RMSEA=0.111, CFI=0.968, NFI=0.958 and TLI=0.952). Table 1.5 summarized the goodness of fit indices, the factor loading estimates and the error variances. Factor loading estimates revealed that seven indicators were strongly related to latent factor -management control systems- and were statistically significant. The indicators MCS1-MCS7 had factor loadings of 0.845, 0.869, 0.862, 0.918, 0.823, 0.774 and 0.519 respectively and error variances of 0.71, 0.75, 0.74, 0.84, 0.68, 0.69 and 0.27 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 management control systems.

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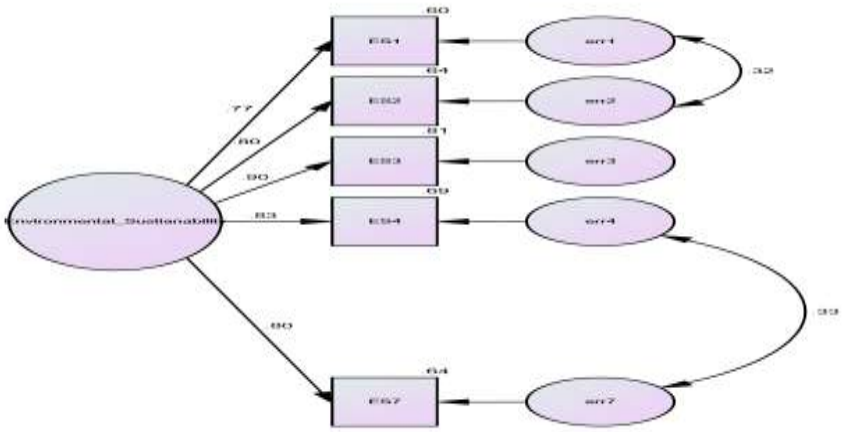


**Figure 1.2: Modified Measurement Model of EnvironmentalSustainability**

**Table 1.6 :Modified Measurement Model Analysis ofEnvironmentalSustainability**

| Model | Chi-Square(df), Significance | $\chi^2$/df | NFI | TLI | CFI | RMSEA | Variable | Factor Loading Estimates | Error VAR |
|---|---|---|---|---|---|---|---|---|---|
| EnvironmentalSustainability | (3df) =5.228 P=0.156 | 1.743 | 0.994 | 0.991 | 0.997 | 0.057 | ES1 | 0.774 | 0.60 |
| | | | | | | | ES2 | 0.802 | 0.64 |
| | | | | | | | ES3 | 0.901 | 0.81 |
| | | | | | | | ES4 | 0.833 | 0.69 |
| | | | | | | | ES5 | deleted | - |
| | | | | | | | ES6 | deleted | - |
| | | | | | | | ES7 | 0.797 | 0.64 |

**Source:** Amos 24.0 output on research data, 2021

Having deleted ES5 and ES6, the factor loadings of ES1-ES4 and ES7 improved to 0.795, 0.820, 0.875, 0.859 and 0.828 respectively. However, the goodness of fit indices retuned mediocre values (chi-square (5df)=42.630, $\chi^2$/df=8.526, p=0.000, RMSEA=0.181, CFI=0.955, NFI=0.949 and TLI=0.909). To improve the goodness of fit indices, coveriances were added between err1 -err2 and err4-err7 as dipected in figure 1.2. The resultant model produced significant factor loadings of 0.774, 0.802, 0.901, 0.833 and 0.797 respectiveley for indicators ES1-ES4, and the goodness of fit indices indicated aaceptable fit to the data for one-factor model (chi-square (3df)=5.228, $\chi^2$/df=1.743, p=0.000, RMSEA=0.057, CFI=0.997, NFI=0.994 and TLI=0.991, as summarised in table 1.6. All freely estimated standardized parameters were statistically significant. These parameters are consistent with the position that these are reliable indicators of the construct of EnvironmentalSustainability.

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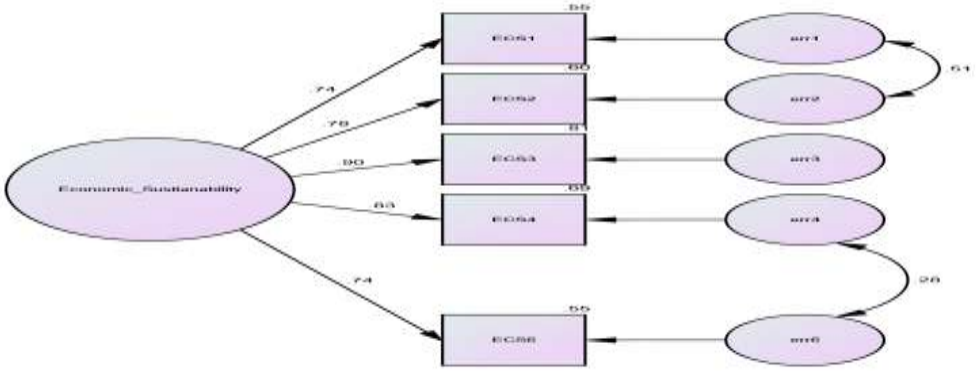


**Figure 1.3: Modified Measurement Model of Economic Sustainability**

**Table 1.7: Modified Measurement Model Analysis of Economic Sustainability**

| Model | Chi-Square(df), Significance | $\chi^2$/df | NFI | TLI | CFI | RMSEA | Variable | Factor Loading Estimates | Error VAR |
|---|---|---|---|---|---|---|---|---|---|
| Economic Sustian-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 |

Table 1.7 summarized the goodness of fit indices, the factor loading estimates and the error variances. The results of the goodness of fit indices indicated mediocre fit to the data for one-factor model (chi-square (9df)=67.559, $\chi^2$/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). 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.

**Table 1.8 : Correlations andAverage Variance Extracted**

| Variable | MCS | ES | ECS | AVE | Sq. Root of AVE |
|---|---|---|---|---|---|
| MCS | **1.0** | 0.770 | 0.792 | **0.657** | **0.811** |
| ES | 0.770 | **1.0** | 0.641 | **0.698** | **0.836** |

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| | | | | | | |
|---|---|---|---|---|---|---|
| ECS | 0.792 | 0.641 | **1.0** | | **0.642** | **0.801** |

**Where:** MCS= management control systems, ES= envromentalSustainability, ECS= economic sustiaability, 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

**3.4.1 Convergent Validity:** The results in Tables 1.8 show that all variables have average variance extracted (AVE) values exceeding the 0.50 threshold recommended by Fornell and Larcker (1981). In addition, all the degrees of freedom, are greater than zero, thus, all the models are over-identified. Therefore, with the AVE>0.5 and the standardised estimates >0.7, it is necessary and sufficient to conclude that the model, has evidence of convergent validity.

**3.4.2 Discriminant Validity:** Discriminant validity was accessed based on the criterion recommended by Fornell and Larcker (1981) which states that "the square root of AVE of each construct must be greater than its correlations with other constructs". In view of this result, it is necessary and sufficient to conclude that the model, has evidence of discriminant validity.

**3.5 Structural Model**

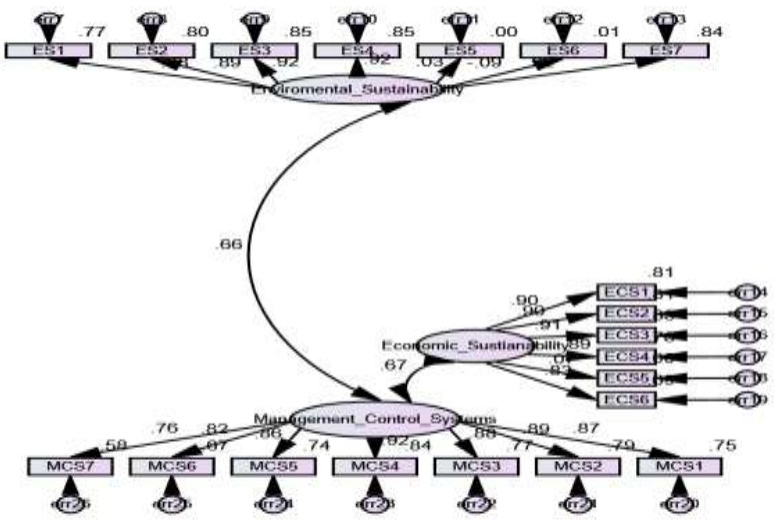


**Figure 1.4 Structural model (linking the hypotheses)**

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This model, adopted the multiple-indicator measurement approach, using the reflective indicators, reflective measurement model and recursive structural model. Therefore, the relationship between constructs is specified after the transition from the measurement model to the structural model.

**Table 1.9 : Test of Hypotheses**

| 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 | MCS →ES (Hypothesis 1) | There is no significant relationship between management control systems and environmental Sustainability. | 0.677 | 2.661 | 0.000 | Positive and Significant | Not supported |
| 2 | MCS →ECS (Hypothesis 2) | There is no significant relationship between management control systems and economic Sustainability. | 0.770 | 3.150 | 0.001 | Positive and Significant | Not Supported |

**3.6 Interpretation of Results (Inferential Analysis):**

The first hypothesis (Ho:1), states that there is no significant relationship between management control systems and environmental Sustainability. However, table 1.9 indicates that management control systems has a positive and significantrelationship with environmental Sustainability of petroleum tank farms in South-South Nigeria (β=0.677, C.R=2.661, p=0.000). Thus, Ho:7 was not supported and the alternate hypothesis is hereby accepted. The evidence presents management control systems as a strong predictor of environmental sustainability of petroleum tank farms in South-South Nigeria. Statistically, it shows that when management control systems goes up by 1 standard deviation, environmental Sustainability goes up by 0.677 standard deviation. In other words, when environmental sustinabilitygoes up by 1 std, management control systemsgoes up by 2.661 std. The regression weight for management control systems in the prediction of environmental sustainability is significantly different from zero at the 0.05 level of significance(two-tailed).

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The second hypothesis (Ho:2), states that there is no significant relationship between management control systems and economic sustainability. However, table 1.9 also suggests that management control systems has a positive and significant relationship with economic sustainability of petroleum tank farms in South-South Nigeria (β=0.770, C.R=3.150, p=0.000). Thus, Ho:8 was not supported and the alternate hypothesis is hereby accepted. This means that the presence of management control systems, in petroleum tank farms in South-South Nigeria, will lead to economic sustainability among the petroleum tank farms. Statistically, it shows that when management control systems goes up by 1 standard deviation, economic Sustainability goes up by 0.770 standard deviation. In other words, when economic sustainabilitygoes up by 1 std, management control systems goes up by 3.150 std. The regression weight for management control systems in the prediction of economic Sustainability is significantly different from zero at the 0.05 level of significance (two-tailed).

**3.7 Discussion of Findings:** The overreaching aim of the study is to identify the relationship between management control systems and organisational sustainability (measured by environmental Sustainability and economic Sustainability) of petroleum tank farms in South South, Nigeria. The study was underpinned by the stakeholder theory (Freeman, 1984) and the moral responsibility theory of corporate Sustainability (Ha-Brookshire, 2017).

**3.7.1 Positive and Significant Relationship between Management Control Systems and Environmental Sustainability**

The first specific objective was to examine the relationship between management control systems and environmental sustainability and was captured by a research question and expressed under Ho:1. This hypothesis stated there is no significant relationship between management control systems and environmental sustainability. The outcome of the data analysis did not support the hypothesis. The result shows that there is a positive and significant relationship between management control systems and environmental sustainability of petroleum tank farms in South South, Nigeria. This implies that increase in management control systems is associated with increase in environmental sustainability. This finding agrees with Mantovani and Pereira (2017) who found that the design of a customer-focused management control systems, serves as a diagnostic tool in monitoring and controlling targets, making adjustments to the budget and reviewing goals. Also, Mantovani and Pereira (2017) found that management control systems make it possible to identify threats and opportunities, turning unprofitable customers into profitable customers. Furtherstill, this finding syncronizes with Ussahawanitchakit (2017) who found that management control systems positively impact organisational renewal and firm sustainability. The finding further validates the the theoretical assertion of the stakeholders theory (Freeman, 1984) which suggests that a firm depends on and needs to put into consideration, any group or individual who can affect or is affected by the achivement of the firm's objectives. Moreover, this finding also corroborates 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.

**3.7.2 Positive and Significant Relationship between Management Control Systems and Economic Sustainability**

The second specific objective was to determine the relationship between management control systems and economic sustainability and was captured by a research question and expressed under Ho:2. This hypothesis stated there is no significant relationship between management control systems 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 management control systems and economic sustainability of petroleum tank farms in South South, Nigeria. This implies that increase in management control systems is associated with increase in customer loyalty. This finding agrees with Gschwantner and Hiebl (2016) who found that rather than a single specific management control system, a package of management control systems and various forms of using such systems may be necessary to successfully achieve and manage organizational ambidexterity. This position further agrees with Ukoha, Alagahand Harcourt (2017) who found that management control systems and organizational effectiveness are significantly related in terms of reducing cost, achieving cohesion and reacting promptly to the dynamic environment to achieve competitiveness and

survival. 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.

**3.8 Conclusion and Recommendations:** This study pratically implies that managers of petroleum tank farms ought to understand how they can stimulate organisationalsustainability through the lens of management control systems. Thus, managers who are keen at improving organisational sustainability of their organisation should be aware of the need to conduct formalized performance on a regular basis, use predetermined criteria in evaluating and compensating employees performance, reward or correct employees based on rigorous measurements of business performance, have a flexible management control systems package in order to allow the organisation to respond quickly to changes in the markets and ensure performance evaluation is used to provide feedback for learning and continuous improvement. This is geared towards higher levels of environmental and economicSustainability. Therefore, it is recommended that management of petroleum tank farms should put in place, mechanisms to enhance management control systems, by ensuring that formalized performance evaluations are conducted regularly, using predetermined criteria in evaluating and compensating employees performance, having a flexible management control systems package to aid quick response to changes in the markets.

**Contributions to knowledge:** The findings of this study reinforces the theoretical assertions of the Stakeholder Theory (Freeman, 1984) and the Moral Responsibility Theory of Corporate Sustainability (Ha-Brookshire, 2017) by measuring and validating a model which captures the structural affinity between management control systems and organisational sustainability. The study also contributes through its specific focus on the petroleum tank farms, as such, the findings can serve to enrich decision making and drive knowledge utility with regards to the activities of petroleum tank farms in the South-South, Nigeria.

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