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MODELLING THE RELATIONSHIP BETWEEN THE LEVEL OF ADOPTION OF SUSTAINABILITY PRACTICES AND PERFORMANCE OF CONSTRUCTION FIRMS USING STRUCTURAL EQUATION MODELLING

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Abstract. The need to carry out construction activities in a sustainable manner in the Niger Delta region of Nigeria has become very imperative. The aim of the study was to establish the relationship between the adoption of sustainable construction practices and performance of construction firms using a structural equation modelling approach. In tandem with the survey approach adopted for the study, 1179 copies of structured questionnaire were administered while 980 valid responses were received giving a response rate of 83.2 %. Data were analysed using descriptive statistics and structural equation modelling. This study revealed that the extent of implementation of sustainable construction practices accounted for 36 %, 37.8 %, 43.5 %, 51.6 %, 65.8 %, and 32.9 % of the variability in annual employment growth, annual financial turnover, remuneration and benefits, general employee satisfaction, social performance and net income growth of the construction firms, respectively. The study concluded that there was a positive relationship between the extent of implementation of sustainable construction practices and firm performance. It was also concluded that the adoption level of sustainable construction practices accounted for 85 % of the variability in the overall firm performance. Hence, proper implementation of sustainability practices at the firm level leads to improvement in the firm performance. It was recommended that construction firms should not use only financial performance indicators to evaluate their performance level but rather use multi-dimensional approaches. This will enable firms to have holistic knowledge of the level of their performance. The construction firms should adopt the structural equation model developed in the study to carry out integrated performance measurement.

Keywords: *level of adoption; Niger Delta; performance of construction firms; relationship; structural equation modelling; sustainability practices.*

INTRODUCTION

There is a growing pressure to develop the environment in a sustainable manner. This includes environmental, social and economic sustainability. The building industry is responsible for infrastructural development of the society but it consumes a lot of resources and energy. In addition, it is responsible for pollution, climate change and other environmental hazards (Klang, Vikman and Brattebo, 2003).

Corporate-level sustainability is the ability to achieve social and environmental needs, as well as company profitability (Porter, 2008). Brundtland (1987) defined sustainable development as that which meets the needs of the present generation without jeopardizing the chances of the future generations to meet their needs. Sustainable construction is explained as the implementation of the principles of sustainable development in the built environment.

Kheni and Akoogo (2015) investigated the trend of sustainable construction in the built environment, which started with a decrease in energy use in order to reduce the environmental impact of construction processes. Furthermore, quality of building materials, components, elements and the type of technology involved were also considered. In addition, sustainable designs were also implemented. Currently, the issue of sustainability in the built environment has gone beyond just the environmental sustainability, as economic and social sustainability have also been incorporated. There is new thinking that requires individuals, construction companies and societies to find models, standards and tools to clarify the extent and ways, in which current activities are not sustainable, and develop a standard scale that will contribute to achieving sustainability in all its forms.

Dania *et al.* (2013) conducted a study on mainstreaming sustainable construction for indigenous and multinational companies in Nigeria. The study concluded that multinational companies had a higher capacity, organisation, higher awareness level, and knowledge base for sustainable construction practices than the indigenous companies. However, it only confirmed the ability of companies to implement sustainability strategies but was unable to establish the relationship between the adoption of sustainable construction practices and firm performance.

Waziri, Yuso, and Osmadi (2015) studied the implementation of sustainable building practices in Nigeria. They stated that a sustainable practice is lightly implemented at the firm level, while moderately implemented at the individual and project levels. However, they were unable to evaluate the factors that accounted for poor implementation, nor did they determine the impact of low adoption rates on business performance. Other studies conducted on sustainability issues in Nigeria include Ikediashi *et al.* (2012), Ujene (2014), Ijaiya (2014), Ekung *et al.* (2014), Barde and Tela (2015) and Ujene and Oladokun (2017), with a very scarce study in the Niger Delta. These studies did not establish the influence of the adoption level of sustainable construction practices on firm performance.

Combs, Crook, and Shook, (2005) revealed that firm performance suffered from a problem of incompatibility and an appropriate consideration for its dimension. Many researchers often use the financial performance measures and ignore the significance of environmental and social performance measures. Researchers present company performance as one-dimensional aspect despite it has been recognised to incorporate multi-dimensionality issues (Glick, Washburn, and Miller, 2005). Shen *et al.* (2010) stated that the incorporation of economic and social performance parameters into firm performance measurement was gaining popularity among scholars. However, Tam (2008) opined that sustainability in the built environment was often viewed in relation to the environment. Given this problem, this study examined the sustainability practices of construction companies in Niger-Delta, (Nigeria) and their contribution to corporate performance.

Critical theory and stakeholder theory are theories that support the model in the present research. The critical theory was applied in the study because of the need to determine the extent of implementation of sustainable construction practices among construction companies and to create an enhanced set of corporate knowledge of sustainability. This, in turn, will reduce the level of conflict and tension between the companies and people of the Niger Delta. The theoretical background used to visualize company performance in the study was stakeholder theory (Agle, Mitchell, and Sonnenfeld, 1999; Kaplan & Norton, 1992; Waddock & Graves, 1997).

Some studies measured performance indicators, but a majority of the measurements were project-based. There are few studies that assessed performance at the corporate level (Ali, Al-Sulaihi, and Al-Gahtani, 2012). In view of this fact, this study assessed a set of KPIs that can be applied by construction managers in measuring construction performance at the corporate level in the Niger Delta and Nigeria at large. Variables for measuring the level of sustainability adoption are firm sustainability practices, and there are ten of them in this study. These include: leadership (Inkoom, 2013), knowledge management practices (Sommerville & Craig, 2006), organisational innovativeness (Widen, 2003), organisational culture (D'Incognito, Costantino & Migliaccio, 2013; Al-Jamea, 2014), corporate governance (Eccles, Ioannun, and Serafeim, 2012), stakeholder engagement (Freeman, Harrison, and Wicks, 2007), transparency and measurement (Epstein, 2008), corporate social responsibility (Crowther, 2000), employment practices (Epstein, 2008) and environmental protection (Inkoom, 2013).

Several studies supported the notion that there was a positive relationship between sustainable building practices and company performance (Uadiale & Fegbemi, 2012; Weshah *et al.*, 2012; Waddock & Graves, 1997). However, some argued that the implementation of sustainable construction practices negatively influenced firm performance. In view of this information, the aim of this study was to establish the relationship between the level of implementation of sustainable construction practices and performance of construction firms using structural equation modelling approach.

1. RESEARCH METHODOLOGY

In tandem with the survey approach adopted for the study, copies of structured questionnaire were administered to the representatives of the firms: project managers, architects, builders and civil engineers. A five-point (1–5) Likert scale was used for data collection (Kazaz, Manisali, and Ulubeyli, 2008; Santos & Brito, 2012). Scale 1 signifies a very low level of implementation/very low level of performance, while scale 5 signifies a very high level of implementation/very high level of performance for the level of implementation of sustainable construction practices and firm performance, respectively (Kazaz, Manisali, and Ulubeyli, 2008; Santos & Brito, 2012). Data were analysed using descriptive statistics and structural equation modelling. Structural equation modelling was used to establish the relationship between the adoption level of sustainable construction practices and firm performance in Niger Delta, Nigeria.

1.1. Sample Frame and Sample Size

Figure 1 shows that Bayelsa has the least number of construction firms operating in the study area, while River State has the highest number of construction companies operating in its surrounding area. This can be attributed to the volume of economic and construction activities taking place in the states. The sample frame and sample size are 1781 and 1179, respectively.

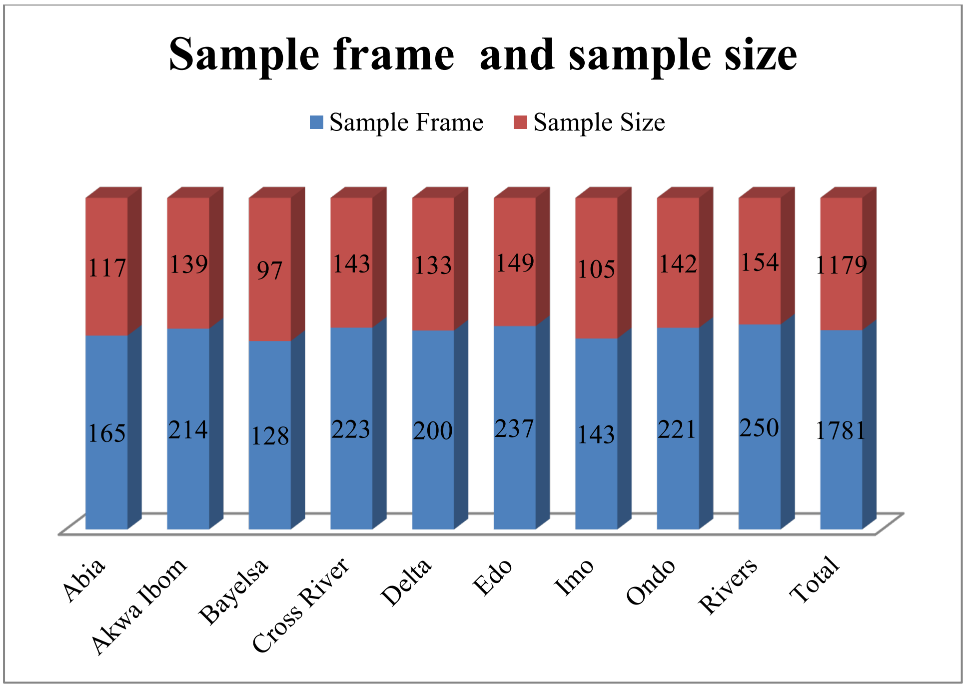

Fig. 1. Sample frame and sample size (developed by the authors).

This research applied Yamane (1967) equation for computation of the sample size as shown in Fig. 1. Equation for sample size is provided in Eq. (1):

$$n = N/1 + N(e)^2, \quad (1)$$

where

n = sample size;
N = finite population;
e = level of significance (0.05);
1 = unity.

1.2. Questionnaire Administration and Response Rate in the Study

Structured questionnaire was used for data collection in the study.

Figure 2 shows that the response rate ranged between 76.10 % and 90.10 %. It shows that a good number of the questionnaires was returned.

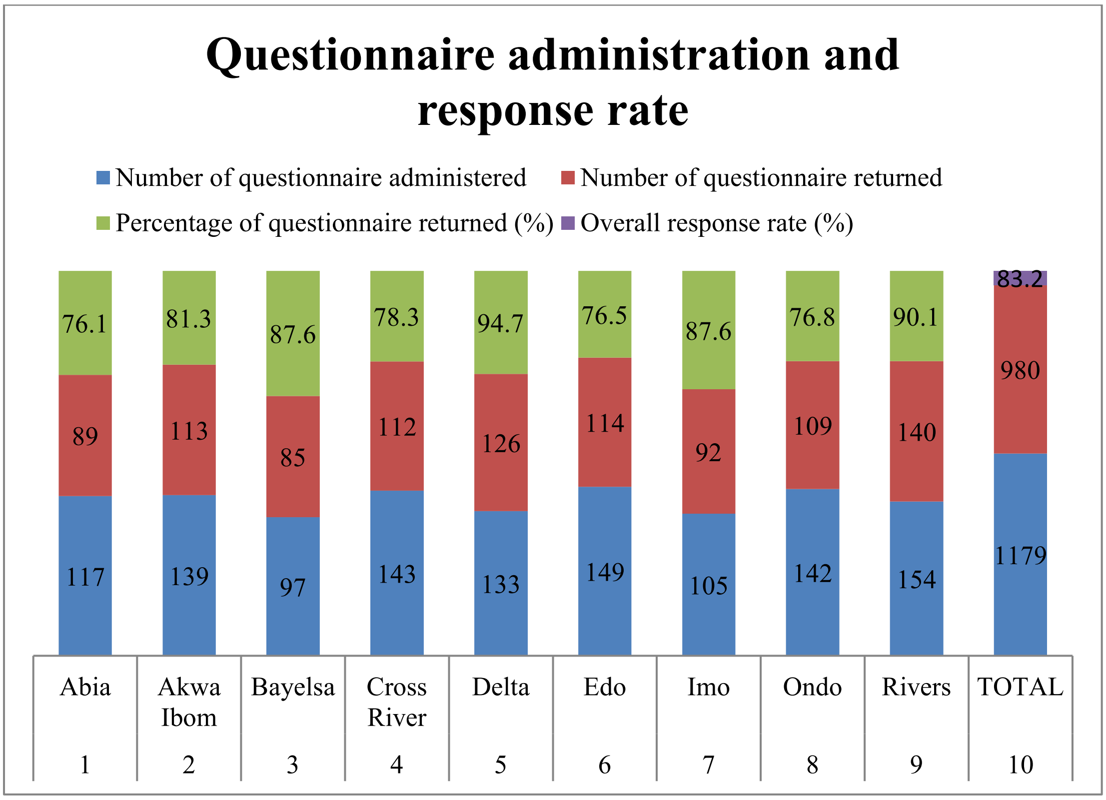

Fig. 2. Questionnaire distribution and response rate (developed by the authors).

It also indicates that firms operating in River State had the highest response rate (90.10 %), while the construction firms operating in Abia State had the lowest response rate (76.10 %).

2. RESULTS OF THE RESEARCH

2.1. Structural Equation Modelling (SEM) for Predicting Performance of Construction Firms from the Adoption of Sustainable Construction Practices

Structural equation modelling was used to predict performance of construction firms from the adoption of sustainable building practices in Niger Delta, Nigeria. These processes include model specification, model estimation and modification, verification and validation of the final model.

Specification of SEM

In SEM specification, the researchers justify the theories underpinning the relationship among the constructs and variables in literature. The model is based on critical and stakeholder theory. Causal relationship between the variables helped to gain a better understanding of the variable exploratory power.

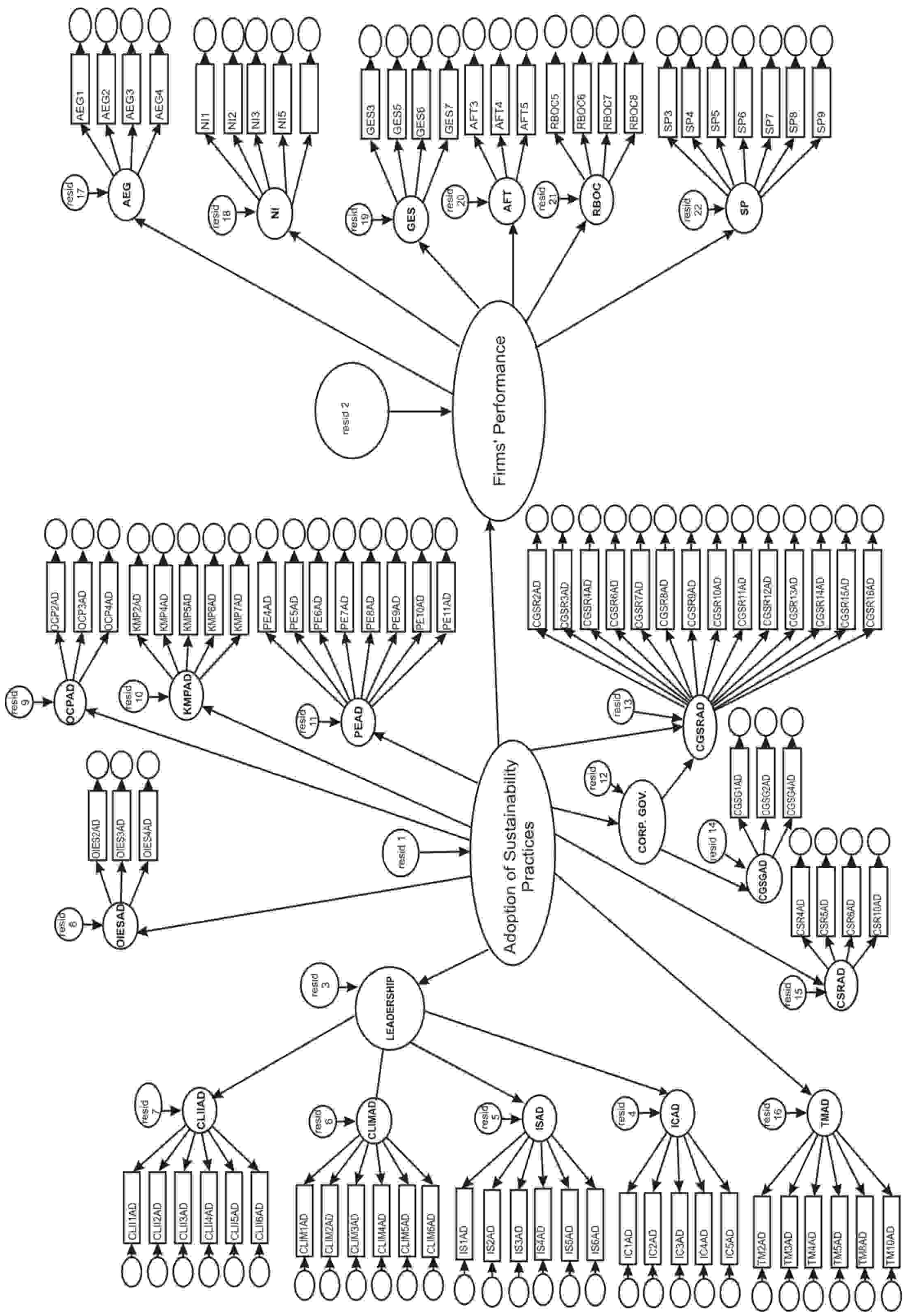

Fig. 3. Hypothesized structural equation model for predicting the performance of construction firms from the adoption of sustainability practices (developed by the authors).

Figure 3 shows the initial hypothetical model for predicting the performance of construction firms from implementation of sustainable building practices in Niger Delta, Nigeria. Model fit tests were carried out on the initial model and the results are presented in Table 1. The results showed that the initial model did not satisfy the model fit indices as specified in literature. Hence, there is a need for the final model as indicated in Fig. 4.

Model Estimation and Modification

Maximum likelihood estimate (MLE) was applied in the study to determine the unique contrast among the elements. The Promax rotation method was used to reveal the underlying dimensions that formed contrast patterns among the variables. Moreover, the Promax rotation method was used because of the large data involved, and it also accounted for the correlation among variables.

The result showed that KMO was 0.941, which confirmed the appropriateness and adequacy for conducting a factor analysis for the data set. This value is greater than the cut off of 0.5 for KMO and Bartlett's test < 0.05. This confirmed the appropriateness and adequacy for conducting the factor analysis for the data set.

The study was not about grouping data because the breakdown of sustainability practices into categories from the literature was made at a preliminary stage. In the same way, sustainability practices, constructs, and variables beneath each construct and firm performance indicators were already categorized at the preliminary phase. PCA was used in this study to reduce the variables and find the smallest components that explained most of the variations in the data set. The result of the rotated matrix of components indicates that no component had less than three variables. It was also found that the correlation r is greater than 0.5 for each variable. This shows a strong relationship among the variables. This also met the condition stated in the literature by Tabachnick and Fidell (2007), who argued that the correlation *r* had to be 0.30 or greater, because anything below suggested a really weak relationship among the variables.

Verification and Validation of the Final Model

The final model was validated using the model fit indices. The results in Table 1 show that the model fit indices of the final model satisfied the bench marks set in literature. The results show that the estimates are within the expected limits. The model parameters indicated in Table 2 Tables 2–6 demonstrate that the final model is acceptable because estimates are within the stipulated bench marks in literature.

The standard error (S.E) shown in Table 2 Tables2–6 revealed a high level of accuracy of parameter estimation. The standard errors in this study were neither too high nor too small. They fell within the accepted range, which proved a strong model. The results show that the *p*- values are less than 0.05. This implies that the estimates are significant at 95 % confidence level. The values of chi-square, goodness of fit, root mean square, error of approximation, comparative fit index, Tucker-Lewis index, normed fit index, incremental fit index and relative index are 1.972, 0.945, 0.064, 0.962, 0.956, 0.938, 0.942 and 0.941, respectively. The values of these model fit indices showed a satisfactory model fit. This study is in tandem with Schumacher and Lomax (2004), Zulu (2007), Hair *et al*. (2010) and Byrne (2010) that used many model fit indices to determine the overall fitness of the model.

Table 1. Model Fit Indices (developed by the authors)

Model Fit Indices	Recommended	Source(s)	Initial Model	Final Model	Remark
X^2/Degree of Freedom	< 2	Byrne, 2001	8.50	1.972	satisfactory
Goodness of Fit (GFI)	0 – 1	Bagozzi & Yi, 2012	0.723	0.945	satisfactory
Root Mean Square Error of Approximation (RMSEA)	≤ 0.10	Tabachnick & Fidell, 2007	0.126	0.064	satisfactory
Comparative Fit Index (CFI)	> 0.9	Kline, 2005	0.755	0.962	satisfactory
Tucker-Lewis Index (TLI)	≥ 0.90	Bagozzi & Yi, 2012	0.884	0.956	satisfactory
Normed Fit Index (NFI)	0 – 1	Doloi, Iyer & Sawhney, 2011	0.887	0.938	satisfactory
Incremental Fit Index (IFI)	0 – 1	Molenaar, Washington & Diekmann, 2000	0.866	0.942	satisfactory
Relative Fit Index (RFI)	0 – 1	Doloi, Iyer & Sawhney, 2011	0.856	0.941	satisfactory

Table 2 shows the estimates of the standardised regression weight, the standard errors, and the *p*-values. Furthermore, another set of criteria to assess the adequacy of the modelist he feasibility of parameter estimates, the appropriateness of standard errors, and the statistical significance of parameter estimates. To check the feasibility, the parameters were checked to ensure that the estimates were correct. The correctness of the estimates implies that each of estimates has the correct values and sign. This is to avoid estimates having the correlation coefficient greater than one (1). The appropriateness of the standard error is also a key parameter for evaluating the adequacy of the model. Table 2 indicates that the values of standard errors are small, which implies a good model fit. The results in Table 2 also show that all the *p*-values are less than 0.05 level of significant set for the test. This indicates that the estimates are significant at 95 % confidence level. These criteria and checks show that the model fit is good.

Table 2. Regression Weights: Group Number 1 – Default Model **(**developed by the authors)

			Estimate	**S.E.**	***P*-value**
FIRMPERFORMANCE	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.923		
CLIIAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.855		

			Estimate	S.E.	*P*-value
CLIMAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.831		
ISAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.823		
ICAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.833		
TMAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.675		
CGSGAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.592		
CSRAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.624		
CGSRAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.568		
OCPAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.659		
KMPAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.630		
PEAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.634		
OIESAD	<---	ADOPTIONOFSUSTAINABILTY_PRACTICES	0.664		
AEG	<---	FIRMPERFORMANCE	0.600		
NI	<---	FIRMPERFORMANCE	0.574		
GES	<---	FIRMPERFORMANCE	0.719		
SP	<---	FIRMPERFORMANCE	0.811		
RBOC	<---	FIRMPERFORMANCE	0.660		
AFT	<---	FIRMPERFORMANCE	0.615		
CLII6AD	<---	CLIIAD	0.595		
CLII5AD	<---	CLIIAD	0.840	0.053	***
CLII4AD	<---	CLIIAD	0.807	0.056	***
CLII3AD	<---	CLIIAD	0.745	0.056	***
CLII2AD	<---	CLIIAD	0.849	0.056	***
CLII1AD	<---	CLIIAD	0.773	0.056	***
TM10AD	<---	TMAD	0.647		

			Estimate	S.E.	***P*-value**
TM8AD	<---	TMAD	0.778	0.052	***
TM5AD	<---	TMAD	0.805	0.048	***
TM4AD	<---	TMAD	0.918	0.045	***
TM3AD	<---	TMAD	0.851	0.046	***
TM2AD	<---	TMAD	0.797	0.049	***
CLIM6AD	<---	CLIMAD	0.673		
CLIM5AD	<---	CLIMAD	0.768	0.055	***
CLIM4AD	<---	CLIMAD	0.864	0.051	***
CLIM3AD	<---	CLIMAD	0.861	0.053	***
CLIM2AD	<---	CLIMAD	0.829	0.053	***
CLIM1AD	<---	CLIMAD	0.844	0.050	***
KMP2AD	<---	KMPAD	0.704		
KMP4AD	<---	KMPAD	0.929	0.055	***
KMP5AD	<---	KMPAD	0.920	0.049	***
KMP6AD	<---	KMPAD	0.917	0.047	***
KMP7AD	<---	KMPAD	0.680	0.043	***
IC5AD	<---	ICAD	0.698		
IC4AD	<---	ICAD	0.768	0.055	***
IC3AD	<---	ICAD	0.873	0.059	***
IC2AD	<---	ICAD	0.718	0.047	***
IC1AD	<---	ICAD	0.675	0.052	***
CGSG1AD	<---	CGSGAD	0.806		
CGSG2AD	<---	CGSGAD	0.921	0.046	***
CGSG4AD	<---	CGSGAD	0.707	0.037	***

			Estimate	S.E.	*P*-value
GES3	<---	GES	0.807		
GES5	<---	GES	0.852	0.038	***
GES6	<---	GES	0.737	0.045	***
GES7	<---	GES	0.864	0.041	***
CGSR2AD	<---	CGSRAD	0.679		
CGSR3AD	<---	CGSRAD	0.842	0.059	***
CGSR4AD	<---	CGSRAD	0.582	0.085	***
CGSR6AD	<---	CGSRAD	0.864	0.056	***
CGSR7AD	<---	CGSRAD	0.856	0.052	***
CGSR8AD	<---	CGSRAD	0.867	0.052	***
CGSR9AD	<---	CGSRAD	0.834	0.044	***
CGSR10AD	<---	CGSRAD	0.512	0.083	***
CGSR11AD	<---	CGSRAD	0.867	0.044	***
CGSR12AD	<---	CGSRAD	0.903	0.043	***
CGSR13AD	<---	CGSRAD	0.864	0.046	***
CGSR14AD	<---	CGSRAD	0.853	0.040	***
CGSR15AD	<---	CGSRAD	0.848	0.043	***
CGSR16AD	<---	CGSRAD	0.851	0.039	***
AEG1	<---	AEG	0.801		
AEG2	<---	AEG	0.957	0.034	***
AEG3	<---	AEG	0.978	0.035	***
AEG4	<---	AEG	0.857	0.036	***
OIES2AD	<---	OIESAD	0.780		
OIES3AD	<---	OIESAD	0.702	0.047	***

			Estimate	S.E.	*P*-value
OIES4AD	<---	OIESAD	0.618	0.050	***
IS6AD	<---	ISAD	0.651		
IS5AD	<---	ISAD	0.835	0.052	***
IS4AD	<---	ISAD	0.790	0.056	***
IS3AD	<---	ISAD	0.732	0.058	***
IS2AD	<---	ISAD	0.800	0.057	***
IS1AD	<---	ISAD	0.762	0.054	***
PE4AD	<---	PEAD	0.841		
PE5AD	<---	PEAD	0.863	0.035	***
PE6AD	<---	PEAD	0.874	0.037	***
PE7AD	<---	PEAD	0.857	0.035	***
PE8AD	<---	PEAD	0.844	0.035	***
PE9AD	<---	PEAD	0.837	0.038	***
PE10AD	<---	PEAD	0.908	0.033	***
PE11AD	<---	PEAD	0.826	0.037	***
CSR4AD	<---	CSRAD	0.818		
CSR5AD	<---	CSRAD	0.877	0.036	***
CSR6AD	<---	CSRAD	0.894	0.033	***
CSR10AD	<---	CSRAD	0.596	0.048	***
NI1	<---	NI	0.992		
NI2	<---	NI	0.987	0.009	***
NI3	<---	NI	0.923	0.016	***
NI4	<---	NI	0.412	0.050	***
NI5	<---	NI	0.660	0.028	***

			Estimate	**S.E.**	***P*-value**
NI6	<---	NI	0.534	0.028	***
SP3	<---	SP	0.812		
SP4	<---	SP	0.833	0.039	***
SP5	<---	SP	0.893	0.041	***
SP6	<---	SP	0.906	0.040	***
SP7	<---	SP	0.894	0.038	***
SP8	<---	SP	0.887	0.039	***
SP9	<---	SP	0.875	0.045	***
RBOC5	<---	RBOC	0.822		
RBOC6	<---	RBOC	0.892	0.038	***
RBOC7	<---	RBOC	0.826	0.037	***
RBOC8	<---	RBOC	0.633	0.034	***
OCP2AD	<---	OCPAD	0.834	0.057	***
OCP3AD	<---	OCPAD	0.866	0.059	***
OCP4AD	<---	OCPAD	0.727	0.056	***
AFT3	<---	AFT	0.848		
AFT4	<---	AFT	0.971	0.029	***
AFT5	<---	AFT	0.890	0.029	***

S.E. – standard error

Table 3 shows the squared multiple correlations of each of the variables in the model. Table 3 reveals the proportion of variability in firm performance as explained by the level of adoption of sustainability practices. The implication of each of the estimates in Table 3 is that each variable is considered to be a dependent variable. For example, the construction firm performance with squared multiple correlation of 0.853 means that 85.3 % of the variability in the performance of construction firms in Niger Delta is explained by the level of adoption of sustainability practices.

Table 3. Squared Multiple Correlations: Group Number 1 – Default Model (developed by the authors)

	Estimate
ADOPTIONOFSUSTAINABILTY_PRACTICES	0.000
FIRMPERFORMANCE	0.853
AFT	0.378
OCPAD	0.434
RBOC	0.435
SP	0.658
NI	0.329
CSRAD	0.390
PEAD	0.402
ISAD	0.677
OIESAD	0.441
AEG	0.360
CGSRAD	0.323
GES	0.516
CGSGAD	0.350
ICAD	0.694
KMPAD	0.397
CLIMAD	0.691
TMAD	0.456
CLIIAD	0.732
AFT5	0.792
AFT4	0.943
AFT3	0.719
OCP4AD	0.528
OCP3AD	0.751
OCP2AD	0.696
RBOC8	0.401
RBOC7	0.682
RBOC6	0.796
RBOC5	0.675
SP9	0.765
SP8	0.786
SP7	0.799
SP6	0.821
SP5	0.797
SP4	0.694
SP3	0.659
NI6	0.285
NI5	0.436
NI4	0.170
NI3	0.851
NI2	0.974
NI1	0.983
CSR10AD	0.355
CSR6AD	0.798

	Estimate
CSR5AD	0.769
CSR4AD	0.668
PE11AD	0.682
PE10AD	0.824
PE9AD	0.701
PE8AD	0.712
PE7AD	0.735
PE6AD	0.764
PE5AD	0.744
PE4AD	0.707
IS1AD	0.580
IS2AD	0.640
IS3AD	0.536
IS4AD	0.624
IS5AD	0.697
IS6AD	0.424
OIES4AD	0.382
OIES3AD	0.493
OIES2AD	0.609
AEG4	0.735
AEG3	0.956
AEG2	0.916
AEG1	0.642
CGSR16AD	0.724
CGSR15AD	0.719
CGSR14AD	0.727
CGSR13AD	0.746
CGSR12AD	0.815
CGSR11AD	0.751
CGSR10AD	0.262
CGSR9AD	0.696
CGSR8AD	0.751
CGSR7AD	0.733
CGSR6AD	0.746
CGSR4AD	0.339
CGSR3AD	0.708
CGSR2AD	0.461
GES7	0.747
GES6	0.544
GES5	0.726
GES3	0.651
CGSG4AD	0.500
CGSG2AD	0.849
CGSG1AD	0.650
IC1AD	0.456
IC2AD	0.516
IC3AD	0.762
IC4AD	0.590

	Estimate
IC5AD	0.488
KMP7AD	0.462
KMP6AD	0.840
KMP5AD	0.845
KMP4AD	0.863
KMP2AD	0.495
CLIM1AD	0.712
CLIM2AD	0.687
CLIM3AD	0.742
CLIM4AD	0.746
CLIM5AD	0.591
CLIM6AD	0.452
TM2AD	0.634
TM3AD	0.724
TM4AD	0.842
TM5AD	0.649
TM8AD	0.606
TM10AD	0.419
CLII1AD	0.597
CLII2AD	0.721
CLII3AD	0.555
CLII4AD	0.651
CLII5AD	0.706
CLII6AD	0.354

The results show that the model fit is adequate and satisfactory.

2.2. Relationship between the Adoption of Sustainable Construction Practices and Performance of Construction Firms

Figure 4 reveals that the adoption level of sustainable construction practices has a direct and positive influence on the performance of construction firms in Niger Delta region of Nigeria ($\beta = 0.923$).

Table 3 shows the standardised direct effects of the variables. The result shows that 85.3 % of the variability in the performance of construction firms in Niger Delta is explained by the adoption level of sustainable construction practices.

The annual employment growth with squared multiple correlation of 0.360 means that 36 % of the variability in the annual employment growth is explained by the adoption level of sustainable construction practices. Also, the annual financial turnover with squared multiple correlation of 0.378 means that 37.8 % of the variability in the annual financial turnover is explained by the adoption level of sustainable construction practices. In the same vein, the net income growth (profitability) of firms with squared multiple correlation of 0.329 means that 32.9 % of the variability in net income is explained by the adoption level of sustainable construction practices.

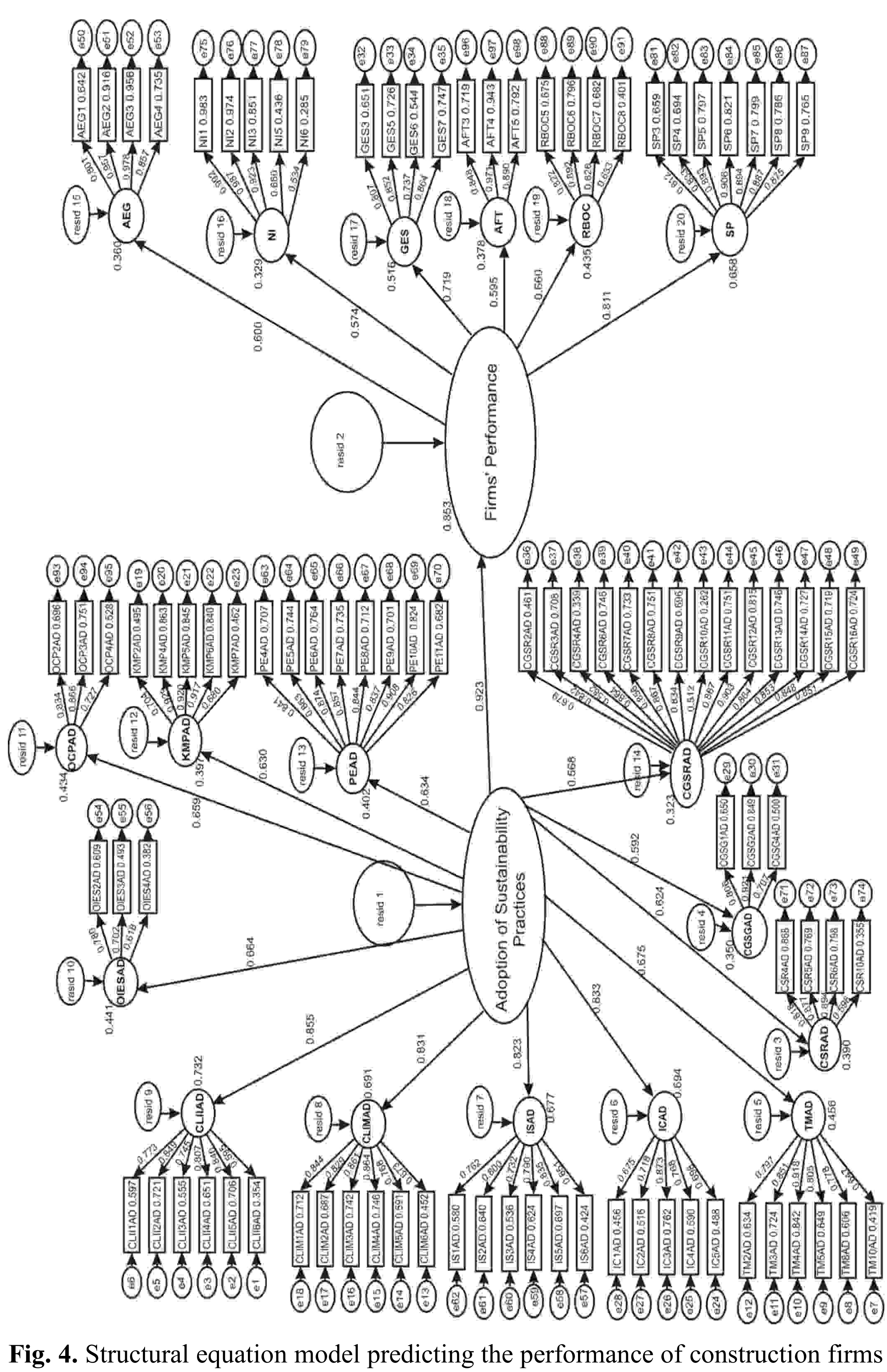

Fig. 4. Structural equation model predicting the performance of construction firms from the adoption of sustainability practices (developed by the authors).

Furthermore, the remuneration and benefits with squared multiple correlation of 0.435 means that 43.5 % of the variability in remuneration and benefits is explained by the adoption level of sustainable construction practices.

General employee satisfaction of firms with squared multiple correlation of 0.516 means that 51.6 % of the variability in general employee satisfaction is explained by the adoption level of sustainable construction practices, and the social performance of firms with squared multiple correlation of 0.658 means that 65.8 % of the variability in the social performance is explained by the adoption level of sustainable construction practices.

3. DISCUSSION OF FINDINGS

The *p*-value of 0.001 implies that there is a significant relationship between the adoption level of sustainable construction practices and the performance of construction firms. Correlation coefficient of 0.923 indicates that the adoption level of sustainable building practices has a direct and positive influence on construction firm performance. It was also revealed that 85.3 % of the variability in the overall performance of construction firms was explained by the adoption level of sustainable construction practices. The study showed that 36 % of the variability in the annual employment growth was explained by the adoption level of sustainable building practices. It was also demonstrated in the study that 37.8 % of the variability in the annual financial turnover was explained by the level of adoption of sustainability practices. Also, 32.9 % of the variability in net income was explained by the adoption level of sustainable building practices, while 43.5 % of the variability in remuneration and benefits was explained by the adoption level of sustainable building practices. The study showed that 51.6 % of the variability in general employee satisfaction was explained by the adoption level of sustainable building practices and 65.8 % of the variability in the social performance was explained by the adoption level of sustainable building practices. This study is consistent with Maletič *et al.* (2014) who stated that sustainable and innovative practices influenced organisational performance.

CONCLUSION

This study investigated the sustainable construction practices and their contribution to firm performance. The study developed the structural equation model that predicted the performance of construction firm from the adoption level of sustainable construction practices. It was found out that there was a positive relationship between the implementation level of sustainable construction practices and firm performance. It was also concluded that the adoption level of sustainable construction practices accounted for 85 % of the variability in the firm performance. It was also determined that the adoption level of sustainable construction practices accounted for 36 %,37.8 %, 43.5 %, 51.6 %, 65.8 %, and 32.9 % in the variability in annual employment growth, annual financial turnover, remuneration and benefits, general employee satisfaction, social performance and net income growth of the construction firms, respectively. This study concluded that proper implementation of sustainable construction practices at the firm level would lead to improvement in the firm performance. In tandem with the findings and conclusion of the study, the following recommendations are thus provided: The construction firms should not use only financial performance indicators to evaluate the level of their performance but rather apply a multi-dimensional approach, which includes financial performance indicators and non-financial performance indicators. This will enable the firms to have a holistic and broader knowledge of their performance. They should improve their adoption level of sustainable construction practices, which will lead to better or improved firm performance. The construction firms should adopt the structural equation model developed in this study to carry out integrated performance measurement.

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