

# DEVELOPMENT OF SUSTAINABLE TRAINING MODELS FROM TASK CHARACTERISTICS FOR IMPROVED PERFORMANCE OF SITE SUPERVISORS IN CONSTRUCTION FIRMS

**Irewolede Aina Ijaola<sup>1</sup> and Godwin Iroroakpo Idoro<sup>2</sup>**

<sup>1</sup>*Department of Building Technology, School of Environmental Studies, Yaba College of Technology, Yaba, Lagos*

<sup>2</sup>*Department of Building, Faculty of Environmental Sciences, University of Lagos, Akoka, Lagos*

The need to develop a sustainable solution to the issue of performance of construction site supervisors cannot be ignored. Previous research identified training as a sustainable way of improving performance of site supervisors. Thus, training of site supervisors is germane for effective performance. However, issues relating the characteristics of site supervisors' tasks to training have not been adequately researched. Thus, there is need to develop a sustainable training model from task characteristics of site supervisors for effective performance. The aim of the paper is to develop a sustainable training model from task characteristics of site supervisors with the view to improving their performance. Based on literature review, a conceptual framework consisting of ten task characteristics variables and four training variables was developed. The research design adopted was cross-sectional survey research design and the research approach was quantitative. A total of 257 questionnaires were purposely distributed to site supervisors working in construction firms in Nigeria and 218 valid questionnaires were returned and use for analysis. The result shows that there is a significant positive relationship between task characteristics and training and that task characteristics is a predictor of training. Based on this, sustainable training models were developed from the task characteristics of site supervisors. It was therefore concluded that the prevalent nature of site supervision task can be used to predict sustainable training practice in construction firms. Construction firms should therefore adopt the sustainable training model as policy for improved performance of site supervisors and for effective human resource development.

Keywords: construction firms, performance, professionals, sustainable, task characteristics, training procedure

## INTRODUCTION

The development of construction industry in Nigeria requires a holistic approach. Sustainable development in construction industry focuses on long time

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<sup>1</sup> [iredbuilder@gmail.com](mailto:iredbuilder@gmail.com)

<sup>2</sup> [iroroidoro@yahoo.com](mailto:iroroidoro@yahoo.com)

improvement as solution to the endemic problems confronting the construction industry in Nigeria. Training as means of development is the continuous process of acquiring skills needed for improvement at present job (Hafeez and Akbar, 2015). Site supervisors are important personnel on construction site and they are responsible for the coordination and direction of activities on construction site (Serpell and Ferrada, 2006). Thus, to train site supervisors in construction industry for improved performance, it is expedient to study and understand the nature of site supervision's tasks as it relate to training. The nature of a task is described as task characteristics (Griffen et al., 1985) and is defined as the attributes that can be used to describe a particular task (Ijaola et al., 2017). These attributes are required in determining sustainable training procedures for site supervisors in construction firms. Although, Lan and Tan (2015) state that construction firms should hire site supervisor that possesses relevant attributes that can lead to positive project outcome, it is also important that construction firms train their site supervisors in line with relevant attributes so as to improve project performance. Serpell and Ferrada (2006) reported that there is serious flaw in training of site supervisor while Dzasu and Ayegbe (2010) noted that construction firms rarely undertake supervisory training. Thus, it is expedient that a sustainable solution to training practices in construction firms be developed. The aim of the study therefore is to develop sustainable training models from task characteristics of site supervisors with the view to improving their performance. The objective of the study is to determine the relationship between task characteristics and training in Nigerian construction firms.

The development of sustainable training model will benefit construction firms in that it will provide a long lasting solution to the issue of training. Furthermore, when the model is adopted as a policy in the firm, it will increase the rate of supervisors' training which will lead to increase in their performance. The focus of the study is on site supervisors working in construction firms in Nigeria. They are employed by contractors and are responsible for site supervision task on site.

## **LITERATURE REVIEW**

### **The nature of Site Supervisor's task**

Site supervisors' tasks are multiple tasks which require them to work with different stakeholders in the construction industry (Ling and Tang, 2015). This calls for a need to study the nature of their task. According to Hackman and Oldham (1976) job characteristics theory, the nature of a task includes skill variety, task identity, task significance, autonomy, feedback. When the condition of a task consists of these characteristics, an individual will experience meaningfulness at work, feel responsible for work outcome and have knowledge of the results of work. In line with Hackman and Oldham, Putra et al. (2018) identify job characteristics as variety of skills, task identity, task significance, autonomy and job feedback. Osibanjo et al. (2018) also describe task characteristics in terms of skill variety, task identity, task significance, sense of autonomy and feedback mechanism.

From a different perspective, Kim and Soergel, (2005) conceptualized task characteristics as task difficulty, task analyzability, task routineness, task complexity and task structuredness while Suman and Srivastava (2009) task characteristics include role ambiguity, role conflict, role overload, role significance, job autonomy,

monetary gain and career scope. Morgeson and Humphrey (2006) task characteristics are autonomy, task variety, task significance, task identity and feedback from job. The previous studies did not examined task characteristics from the perspective of site supervisors. In studying the task characteristics of site supervisors, Ijaola et al. (2017) identifies the nature of site supervisor's task as skill variety, task identity, task significance, autonomy, feedback, task difficulty, task analyzability, task routineness, task complexity and task structuredness. The study therefore adopts Ijaola et al. (2017) site supervisor's task characteristics as variables for task characteristics.

### **Training of Site Supervisors**

Site supervisors are important human resource in the production stage in construction industry. According to Serpell and Ferrada (2006), site supervisors are personnel on construction site that coordinate and direct the execution of the construction process. They serve as mediator between the site manager and workers on site and they are also professionals that coordinate and monitor the construction works on site. Their tasks include; deciding on when to commence and suspend construction process (Hackman et al., 2015); ensuring compliance with health and safety practice on site (Serpell and Ferrada, 2006; Hackman, et al. 2015); communicating project objectives to workers on site (Serpell and Ferrada, 2006).

Since site supervisors are required to monitor the construction production stage, sustainable training as it relates to the nature of their task is important for improve performance. Serpell and Ferrada (2006) noted that there is lack of formal training to qualify site supervisor for taking on supervisory responsibilities. This lack of training increases construction cost due to inability of site supervisors to effectively carry out their supervisory role. Furthermore, Dzasu and Ayegba (2010) discovered that few construction firms in Nigeria carry out supervisory training yearly. Thus, it is expedient that construction firms train their site supervisors.

Loosemore et al. (2003) identify five procedures of training in the construction sector as training policy definition, training needs identification, training programme, training delivery and training evaluation while Mathis and Jackson (2011) identify four training procedures as training needs assessment, training design, training delivery and training evaluation. A broader classification by Huang (2001) considers training procedures as training needs identification, annual training design, training objectives, training delivery, training implementation, training evaluation and training records. From the training procedures cited above, none of the authors considered training transfer. The study therefore conceptualise training procedures as training needs assessment, training delivery, training evaluation and training transfer

### **PROBLEM STATEMENT/ RESEARCH QUESTION**

From the literature review, ten task characteristics which formed the independent variable were identified and four training procedures which formed the dependent variable were also identified. Previous studies examined the relationship between task characteristics and task performance (Kassem and Sarhan, 2013; Evelyne et al. 2018) and between training and task performance (Onukwube and Iyagba, 2011;

Sila, 2014, Hafeez and Akbar, 2015; Dugin et al. 2015). The relationship between task characteristics and training has not been adequately examined. Thus, there is a gap in research on task characteristics as it relates to training. The study therefore proposes that;

H1: there is no significant relationship between the prevalence of task characteristics and training procedures of construction site supervisors.



*Fig. 1: Relationship between task characteristics and training procedures*

## **RESEARCH DESIGN AND METHODS**

A cross-sectional survey research design was adopted for this study with a quantitative research approach. This is because primary data were required and population for the study was large.

### **Data collection**

The instrument for data collection was structured questionnaire and it was used to elicit information on the prevalent task characteristics of site supervisors and the frequency of implementing training in construction firms. The questionnaire was divided into three sections, the first section focused on personal details of respondent, the second section focused on the prevalent characteristics of site supervisors' tasks while the third section focused on the frequency of implementing training in construction firms. Based on the conceptual framework developed in this study, task characteristics consists of ten latent variables namely; Skill variety, Task identity, Task significance, Autonomy, Feedback, Task analyzability, Task difficulty, Task routineness, Task complexity, Task structuredness. Questions were asked in statement form to determine the level of agreement of site supervisors on the prevalent nature of their task. Skill variety consisted of 2 observable variables that described the degree to which site supervisor's task requires the use of varieties of skills. For example "My task involves the use of variety of skills to execute them". Task identity which explained the degree, to which a site supervisor's task requires the completion of the task from the beginning to the end, was measured with 3 observable variables. For example "My tasks are complete from the start to finish". Task significance was also measured with 3 variables and it described the extent to which site supervisor's task has impact on people's lives and the environment at large. Autonomy is the

degree to which site supervisors have substantial freedom to make decisions when executing their task. It was measured with 3 variables, for example "My task gives me the chance to use my personal initiative or judgment in carrying out the task". Feedback described the degree to which a site supervisor receives clear information about his/her performance after executing the task. It was measured with 3 observable variables such as "My supervisor frequently discusses matters related to my job performance". Task analyzability which described the extent to which site supervisor's task has a clearly defined sequence of steps was measured with 2 observable variables such as "My tasks involve a clearly defined sequence of steps". Task difficulty which explained the degree to which site supervisor's task requires great effort to accomplish was measured with 2 observable variables. For example, "My tasks require great physical effort to accomplish it". Task routineness described the degree to which a site supervisor requires habitual method of carrying out his/her task. This was measured with 2 observable variables, for example "My tasks involve a habitual method of carrying it out". Task complexity is the degree to which site supervisor's task is made up of interconnected or related structures. It was measured with 2 observable variables such as "The nature of my task is complex in structure". The last latent variable on task characteristics 'task structuredness' was measured with 2 observable variables and it described the degree to which site supervisor's tasks have a definite and highly organised structure. For example "My tasks involve the application of a limited number of rules and principles with well-defined parameter for convergent".

Training procedure consists of four major variables namely; training needs assessment, training delivery, training evaluation and training transfer. Questions were asked to determine the frequency of training site supervisors in construction firms. Training needs assessment which described the indicators for training site supervisors was measured as a latent variable and consists of 15 observable variables in statement form, such as, "the frequency at which my training needs are determined by the company through personal face to face interview with managers and supervisor is.....". The second training procedure variable named 'training delivery' was also measured as latent variable and comprised 22 statements explaining areas of training and methods of delivering training. For example, "the frequency at which the company sponsors me to workshops, seminars or conferences is...." . Training evaluation explained ways of assessing training received by site supervisors. It was also measured as a latent variable and consisted of 8 observable variables stated in statement form. For example, "the frequency at which the company asks the trainees' managers or supervisor for their assessment of my learning is.....". The fourth training procedure 'training transfer' emphasised the transfer of what was gained during training to present job. It comprised of 5 statements such as "the company assigns me duties related to the training I received to a ....." .

To check for reliability of the scale of the instruments, Cronbach Alpha Coefficient for task characteristics and training were found to be 0.98 and 0.86, which are above the recommended level of 0.7 (Field, 2009). This shows that the research instruments are highly reliable.

The population of the study comprised site supervisors in construction firms in Lagos and Abuja. This is to ensure uniformity in the nature of their task and the



subject of training. Abuja and Lagos were considered as location in this study because Lagos is known as the commercial capital of Nigeria while Abuja is the nation's capital, and as such are well populated. As a result of high population, the volume of construction activities is high and most of the construction firms operating in Nigeria are located in these two territories. Furthermore, because there is no list of professionals working as site supervisors, a purposive sampling technique was adopted. A total 257 questionnaires were distributed and 218 valid questionnaires were retrieved and use for analysis.

## ANALYSIS AND RESULTS

### Relationship between task characteristics and training

To determine the relationship between the prevalence task characteristics and training of site supervisors, and to test the hypothesis which states that there is no significant relationship between task characteristics variables and training variables, Pearson Moment Correlation was used for the analysis. Pearson moment correlation is used when there is need to test for relationship among variables and when the data is parametric. When there are series of Likert items that sum up to a composite variable, then the variable can be referred to as interval scale (Boone & Boone, 2012; Warmbrod, 2014) and thus be analysed using the parametric method. Based on this, each task characteristics and training is a composite variable and therefore can be referred to as interval scale. The criterion for the acceptance of the hypothesis was based on the rule that that when the  $p$  value  $\leq 0.05$ , then it is statistically significant therefore the test reject the hypothesis but when the  $p$  value is  $> 0.05$ , then it is not significant, therefore, the hypothesis is accepted. Table 1 presents the mean, standard deviation and correlation between variables.

**Table 1: Mean, Standard Deviations and Correlations between Variables**

Variables correlated	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Skill variety	4.17	0.72	1													
Task identity	4.11	0.75	.443**	1												
Task significance	4.24	0.68	.447**	.495**	1											
Autonomy	4.16	0.63	.364**	.509**	.597**	1										
Feedback	4.07	0.68	.464**	.429**	.502**	.481**	1									
Task analysability	4.03	0.72	.319**	.552**	.485**	.535**	.443**	1								
Task difficulty	3.91	0.92	.231**	.456**	.309**	.510**	.204**	.595**	1							
Task routineness	3.63	0.91	.181**	.458**	.197**	.389**	.331**	.448**	.597**	1						
Task complexity	3.78	0.97	.208**	.474**	.379**	.455**	.308**	.574**	.678**	.563**	1					
Task structuredness	3.85	0.80	.307**	.537**	.424**	.513**	.369**	.624**	.645**	.547**	.715**	1				
Training Needs Assessment	3.25	0.70	.377**	.292**	.149*	.269**	.450**	.253**	.217**	.394**	.262**	.271**	1			
Training Delivery	3.32	0.70	.168*	.209**	.160*	.199**	.363**	.195**	0.06	.231**	.161*	.156*	.764**	1		
Training Evaluation	3.25	0.79	.173*	.246**	.168*	.208**	.412**	.235**	0.11	.237**	.181**	.175**	.742**	.836**	1	
Training Transfer	3.45	0.81	.288**	.235**	.253**	.245**	.447**	.289**	0.075	.186**	.148*	.171*	.734**	.776**	.832**	1

\*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

The results in Table 1 show that the  $p$  values for nine task characteristics variables are less than 0.05, therefore the hypothesis is rejected. This shows that a positive and significant relationship exists between the nine variables of task characteristics namely skill variety, task identity, task significance, autonomy, feedback, task analysability, task routineness, task complexity, and task structuredness and four

variables of training namely training needs assessment, training delivery, training evaluation and training transfer. The p value for task difficulty and training needs assessment is lesser than 0.05 and greater for training delivery (0.379), training evaluation (0.107) and training transfer (0.075). Thus, the hypothesis is rejected for training needs assessment but accepted for the other training variables. This shows that that a significant positive relationship exists between task difficulty and training needs assessment but no significant relationship with training delivery, evaluation and transfer.

This implies that task characteristics influence training of site supervisors. The result indicates that the higher the prevalence of task characteristics in site supervisors' task, the higher the construction firm identifies the training areas and needs of site supervisors. The higher the prevalence of task characteristics in site supervisors' task, the higher the construction firms deliver training to the site supervisors. The higher the prevalence of task characteristics in site supervisors' task, the higher the construction firms measure training outcome of site supervisor. The higher the prevalence of task characteristics in site supervisors' task, the higher the site supervisor transfer what has been learnt.

### Training Models

To develop a sustainable training model from task characteristics for improved performance of site supervisor, regression analysis was employed. Table 2 presents the regression model for training of site supervisors.

**Table 2: Regression Model for Training**

Variables	TNA			TD			TE			TF		
	B	SEB	$\beta$	B	SEB	$\beta$	B	SEB	$\beta$	B	SEB	$\beta$
(Constant)	0.86	0.32		1.69	0.36		1.24	0.40		0.89	0.40	
SV	0.25	0.07	0.26*	0.01	0.08	0.01	-0.02	0.08	-0.02	0.13	0.08	0.11
TI	0.00	0.07	0.00	0.04	0.08	0.05	0.09	0.09	0.09	-0.01	0.09	-0.01
SI	-0.21	0.08	-0.21*	-0.06	0.09	-0.06	-0.09	0.10	-0.08	-0.01	0.10	-0.01
AU	0.06	0.09	0.05	0.06	0.10	0.05	0.01	0.11	0.01	0.04	0.11	0.03
FB	0.33	0.08	0.32'	0.30	0.09	0.292*	0.44	0.10	0.381*	0.39	0.10	0.33'
AN	-0.02	0.08	-0.02	0.06	0.09	0.06	0.08	0.10	0.07	0.22	0.10	0.19'
DI	-0.05	0.07	-0.06	-0.14	0.08	-0.19	-0.07	0.09	-0.08	-0.14	0.09	-0.16
RO	0.21	0.06	0.27	0.13	0.07	0.17	0.09	0.08	0.11	0.08	0.08	0.09
CO	0.05	0.07	0.08	0.06	0.07	0.08	0.05	0.08	0.06	0.01	0.08	0.02
ST	-0.02	0.08	-0.03	-0.04	0.09	-0.05	-0.07	0.10	-0.07	-0.07	0.10	-0.07
R <sup>2</sup>		0.33			0.16			0.20			0.23	
$\Delta R^2$		0.30			0.13			0.16			0.20	
F		10.145			4.016			4.957			6.245	

Multiple regression model was used to test if task characteristics significantly predicted training needs assessment. The result of the regression in Table 2 showed that 10 task characteristics variables explained 33.1% of the variance ( $R^2=.33$ ,  $F(10,205) = 10.142$ ,  $p < 0.001$ ). This implies that 33.1% of variation in training needs assessment can be explained by the model containing 10 task characteristics variables. It was found that skill variety ( $\beta=.25$ ,  $p < 0.001$ ), task significance ( $\beta=-.21$ ,  $p < 0.001$ ), Feedback ( $\beta=.33$ ,  $p < 0.001$ ) and task routineness ( $\beta=.21$ ,  $p < 0.001$ ) significantly predicted training needs assessment.

$$\text{TNA} = .86 + .25(\text{SV}) + .00(\text{TI}) - .21(\text{TS}) + .06(\text{AU}) + .33(\text{FB}) - .02(\text{TA}) - .05(\text{TD}) + .21(\text{TR}) + .05(\text{TC}) - .02(\text{TSt}) \quad \text{.....equation 1}$$

The implication is that as site supervisor uses one additional variety of skills, he would require extra 0.253 training needs assessment. Also, as site supervisor tasks impact people lives by one unit, training needs assessment of the site supervisor decreases by 0.211. Furthermore, when there is increase in one unit on feedback from task done by site supervisors, there is increase in training needs assessment of the site supervisor by 0.331. Finally, when there is increase by one unit in the prevalence level of a habitual method of carrying out tasks by site supervisor, training needs assessment of the site supervisor decreases by 0.208.

Multiple regression analysis was also used to test if task characteristics significantly predicted training delivery. The result of the regression in Table 2 indicated that 10 task characteristics variables explained 19.5% of the variance in training delivery ( $R^2=.195$ ,  $F(10, 205) = 4.016$ ,  $p<.001$ ). It was found that feedback significantly predicted training delivery ( $\beta=.30$   $p<0.001$ ). This implies that as the level of prevalence of site supervisors' feedback from task increases by one unit, training delivery increase by .300.

$$\text{TD} = 1.69 + .01(\text{SV}) + .04(\text{TI}) - .06(\text{TS}) + .06(\text{AU}) + .30(\text{FB}) + .06(\text{TA}) - .14(\text{TD}) + .13(\text{TR}) + .06(\text{TC}) - .04(\text{TSt}) \quad \text{..... equation 2}$$

Multiple regression analysis was carried out to investigate if task characteristics variables significantly predicted training evaluation. The result of the regression in Table 2 indicated that task characteristics variables explain 19.5% of the variance in Training evaluation ( $R^2=.195$ ,  $F(10, 205) = 4.975$ ,  $p<.001$ ). It was discovered that feedback significantly predicted training evaluation ( $\beta=.44$   $p<0.001$ ). This means that as the level of prevalence of feedback from task of site supervisor increases by one unit, training evaluation increases by 0.441.

$$\text{TE} = 1.24 - .02(\text{SV}) + .09(\text{TI}) - .09(\text{TS}) + .01(\text{AU}) + .44(\text{FB}) + .08(\text{TA}) - .07(\text{TD}) + .09(\text{TR}) + .05(\text{TC}) - .07(\text{TSt}) \quad \text{..... equation 3}$$

The fourth multiple regression model was carried out to test if task characteristics variables significantly predicted training transfer. The result of the regression in Table 2 indicated that 23.3% of variation in training transfer can be explained by the model containing 10 task characteristics variables ( $R^2=.233$ ,  $F(10, 205) = 6.245$ ,  $p<.001$ ). It was found that feedback ( $\beta=.39$   $p<0.001$ ) and task analyzability ( $\beta=.22$   $p<0.001$ ) significantly predicted training transfer. The implication is that as feedback from site supervisor's task becomes more prevalent by one unit, training transfer increases by 0.39. Also, as there is increase in the prevalence of site supervisor's task involving clearly defined sequence of steps, training transfer increases by 0.22.

$$\text{TT} = .89 + .13(\text{SV}) - .01(\text{TI}) - .01(\text{TS}) + .04(\text{AU}) + .39(\text{FB}) + .22(\text{TA}) - .14(\text{TD}) + .08(\text{TR}) + .01(\text{TC}) - .07(\text{TSt}) \quad \text{..... equation 4}$$



## **DISCUSSION OF RESULTS**

The result from the hypothesis shows that there is a significant relationship between nine task characteristics variables and four training procedures. This means that the higher the prevalence of task characteristics namely: skill variety, task identity, task significance, autonomy, feedback, task analyzability, task routineness, task complexity and task structuredness in construction professionals' task, the higher the systematic procedures for carrying out training namely: training needs assessment, training delivery, training evaluation and training transfer in construction firms. This emphasises the importance of understanding the nature of site supervisor's task before conducting training. Morgeson and Humphrey (2006) have a contrary view; the duo discovered that there is no relationship between task characteristics and training. Differences in the task characteristics and training variables could contribute to the differences in the findings of this study and that of Morgeson and Humphrey. For example, comparison between the task characteristics variables in this study and that of Morgeson and Humphrey shows differences. Morgeson and Humphrey conceptualized task characteristics as autonomy, task variety, task significance, task identity and feedback from job in. Furthermore, autonomy was subdivided into 3 latent variables of work scheduling autonomy, decision making autonomy and work methods autonomy. Furthermore, differences in the industry where the research was undertaken could be a major reason for the contrary view. This study is carried out in the construction industry with site supervisors as respondent while Morgeson and Humphrey focused on job incumbent.

Another major finding was that task characteristics variables (skill variety, task significance, feedback, task routineness) were found to be predictors of training; however, task significance and routineness show a negative influence. The finding supports Rausch (2018) study where task characteristics were found to be predictors of learning. Although, the variables were different from the variables of this study, for example feedback, novelty, scope of action, interestingness. Yet the finding from Rausch is similar to the finding of this study in that the task characteristics of both studies predicted training.

## **CONCLUSION AND RECOMMENDATIONS**

The study investigated the relationship between task characteristics of site supervisors and training in construction firms in Nigeria. The finding shows that a significant positive relationship exists between task characteristics and training. Therefore, the study concludes that the prevalent nature of site supervisors' task influences training in construction firms. Furthermore, the study found that task characteristics predict training. Thus, the study further concludes that the prevalent nature of site supervision task can be used to predict in advance the training processes in construction firms. The developed training models can be said to be sustainable since the models were developed from significant task characteristics of site supervisors. Hence, the sustainability of the model lies in the fact that the model was developed from the characteristics of site supervisors' task which is consistent over time and thus can last longer.

The study has filled a gap in knowledge in construction industry by developing sustainable training models from task characteristics of site supervisor. Therefore, for improved performance of site supervisors, construction firm should adopt the sustainable developed training models as policy and practices in predicting ahead the training of site supervisor. Also, construction firms should use the task characteristics variables discovered in this study to determine the nature of site supervision tasks in their company. They should adopt the training procedures discovered in this study to train their site supervisors in order to have a sustainable development in their organisation. Future studies should consider other task characteristics variables such as task creativity in developing training model so as to establish sustainable solutions to the issue of development in construction industry in Africa.

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