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# MODELLING THE RELATIONSHIP BETWEEN TASK CHARACTERISTICS AND TRAINING OF SITE SUPERVISORS IN NIGERIAN CONSTRUCTION FIRMS

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Despite the significance of site supervisors, there are concerns that their training has been inadequate and issues relating the characteristics of site supervisors' tasks to training have not been adequately researched into. The study aims to develop training models from the task characteristics of site supervisors with the view to improving training practices in construction firms. Based on the literature review, a conceptual framework consisting of ten task characteristics variables and four training variables was developed. The research design adopted was a cross-sectional survey design with a quantitative approach. 257 questionnaires were purposely distributed to site supervisors working in construction firms in Nigeria and 218 valid questionnaires were returned and used for the analysis. The result shows that there is a significant positive relationship between task characteristics and training. Based on this, the study developed training models from the task characteristics of site supervisors. The study concludes that the prevalent nature of site supervision tasks predicts training practices in construction firms. This study contributes to knowledge by developing training models from task characteristics of site supervisors. Construction firms should therefore adopt the training models as a policy for effective training practices and for improving the performance of site supervisors.

Keywords: construction firms, site supervisor, task characteristics, training models, training practices

## INTRODUCTION

Site supervisors' competency is essential, particularly in the aspect of training workers on construction sites (Okorie and Musonda, 2018). This implies that

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the training of site supervisors is essential for training and monitoring of workers' performance. Furthermore, the training of the site supervisors is important for the successful completion of construction projects. Training is the continuous process of acquiring skills needed for improvement at the present job (Hafeez and Akbar, 2015). Hence, training of site supervisors for continuous skills' acquisition is imperative. Site supervisors are important personnel on the construction site and they are responsible for the coordination and direction of activities (Serpell and Ferrada, 2006). Thus, to train site supervisors in the construction industry, it is expedient to consider and understand the nature of site supervision's tasks as it relates to training. Task characteristics describe the nature of a task (Griffen et al., 1985) and the attributes of a particular task (Ijaola et al., 2017). These attributes are required in organising training programmes for site supervisors in construction firms. Although Ling and Tan (2015) stated 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 site supervisors in line with relevant attributes for proper training process. Serpell and Ferrada (2006) reported that there is a serious flaw in the training of site supervisors while Dzasu and Ayegbe (2010) concluded that construction firms rarely undertake supervisory training. Hence, it is expedient that training programmes that are in line with the characteristics of site supervisory tasks be developed in construction firms.

Previous studies focused on the relationship between task characteristics and different dependent variables such as social communication (Koo et al., 2011), turnover (Ferreira et al., 2017) and task performance (Zawawi and Nasurdin, 2017). Few studies considered the relationship between task characteristics and training. For example, Koo et al. (2011) examined the relationship between task characteristics and usage of social communication technologies. Task analyzability, task urgency and task complexity were the dimensions of task characteristics. It was discovered that task characteristics relates to media. Koo et al. (2011) did not consider the relationship between task characteristics and training. Ferreira et al. (2017) investigated the relationship between task characteristics and turnover. Task characteristics dimensions were task significance and task identity. The result shows that job satisfaction and job embeddedness fully mediated the relationship between task characteristics and turnover. Again, the relationship between task characteristics and training was not considered. Zawawi and Nasurdin's (2017) dimensions of task characteristics were task identity, task significance and task interdependence. The relationship between these dimensions and team performance was investigated. The result shows that only one dimension of task characteristics (i.e., task significance) predicted team performance.

Bossche et al. (2010) investigated the role of feedback in training transfer, it was discovered that the number of people providing feedback and helpfulness of feedback relate to training transfer. However, only one dimension of task characteristics (i.e., feedback) and one dimension of training (i.e., training transfer) were investigated. In addition, Kester and Oludeyi (2017) examined the relationship between task characteristics and training programmes. It was discovered that feedback correlates with training effectiveness. Again, only one

dimension of task characteristics (i.e., feedback) and one dimension of training (i.e., training effectiveness) were considered. It seems there is a gap in research on the relationship between task characteristics and training. The aim of this study is to develop training models from task characteristics of site supervisors with the view to improving training practice in construction firms. The objectives of the study are; to investigate the prevalent task characteristics of site supervisors, to determine the frequency of implementing training among site supervisors, and to determine the relationship between task characteristics and training in Nigerian construction firms.

The development of training models will benefit construction firms by providing a long lasting solution to the issue of training site supervisors. Furthermore, when the model is adopted as a policy in the firm, it will increase supervisors' training practice. 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 tasks on the construction site.

## LITERATURE REVIEW

### Training of site supervisors

Site supervisors are important human resources in the production stage in the construction industry. According to Serpell and Ferrada (2006), site supervisors are personnel on the construction site that coordinate and direct the execution of the construction process. They serve as a mediator between the site manager and workers on site and are professionals that coordinate and monitor the construction works on site. Site supervisors' 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); conducting health and safety training on site (Okorie and Musonda, 2018). Since site supervisors are required to monitor the construction production stage, their training in line with the nature of site supervision's task is important for effective performance. Serpell and Ferrada (2006) noted that there is a lack of formal training to qualify site supervisors for taking on supervisory responsibilities. This lack of training increases construction costs due to the inability of site supervisors to carry out effectively their supervisory role.

Furthermore, the construction industry in Nigeria has been criticised for lack of attention towards the training of professionals. Studies on training of site supervisors in construction firms reported flaws in the training process. Dzasu and Ayegba (2010) discovered that few construction firms in Nigeria carry out supervisory training yearly. Ikediashi et al. (2012) reported a disparity in training policies of staff and technical personnel in construction firms. Factors responsible for inadequate training in construction firms according to Ikediashi et al. (2012) include; first, the nature of employment in construction firms which is majorly self-employment. Second, the dominance of the Nigerian construction industry with multinational construction firms whose interest is in making profits. Other factors include poverty, government negligence, lack

of effective regulatory body, and inadequate support from the construction industry (Dantong et al., 2003). The impact of this inadequate training is evident in different aspects of the construction process. Such impact includes the inability of site supervisors to conduct construction site health and safety induction training (Okorie and Musonda, 2018). Thus, site supervisors must be trained adequately in line with task characteristics.

**Hackman and Oldham Job Characteristics Theory**

Hackman and Oldham's job characteristics model tested the relationship between job characteristics and responses of the individual to work. In the model, five core job characteristics link to psychological states and the psychological states link to personal and work outcomes (Hackman and Oldham, 1976). The link between the job dimensions and psychological states and the link between psychological states and outcomes is moderated by workers' growth needs and strengths. The five core job dimensions are skill variety, task identity, task significance, autonomy and feedback. Skill variety, task identity and task significance contribute to meaningfulness of work, autonomy contributes to experiencing responsibility and feedback contributes to knowledge of results (Hackman and Oldham, 1976).

Hackman and Oldham's job characteristics theory posits that one of the ways of increasing employee performance and personal outcome through job enrichment is by allowing individuals to develop personal achievement. Furthermore, the theory recognises and assesses employee's needs for growth and development in their work (Hussein, 2018). Providing the opportunity for developing personal achievement and growth can be achieved through training of the individual.

Linking Hackman and Oldham's job characteristics theory to training, the study proposes that increasing the performance of site supervisors in construction firms through job enrichment requires the development of personal achievement. This can be achieved through the training of the site supervisor.

**The nature of the site supervisor's task**

Site supervisors' tasks are multiple tasks that require working with different stakeholders in the construction industry (Ling and Tang, 2015). This calls for a need to study the nature of their tasks. According to Hackman and Oldham (1976) job characteristics theory, the nature of a task includes skill variety, task identity, task significance, autonomy and 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) identified the dimensions of job characteristics as skill variety, task identity, task significance, autonomy and job feedback. Osibanjo et al. (2018) also described 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) conceptualised 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's (2006) task characteristics are autonomy, task variety, task significance, task identity and feedback from the job. These previous studies did not examine task characteristics from the perspective of site supervisors. In studying the task characteristics of site supervisors, Ijaola et al. (2017) identified the nature of the 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.

**The Conceptual Framework**

Otuka et al. (2013) conceptualised training variables as training needs assessment, training contents and delivery approaches and training evaluation while Mathis and Jackson (2011) identified four training procedures as training needs assessment, training design, training delivery and training evaluation. Inn et al. (2010) investigated the dimensions of training effectiveness on post training outcomes of quality management system, training dimensions were conceptualised as training infrastructure, training feedback, training documentation, training schedule and external resources. None of the authors considered training transfer as training variables from the literature cited above, although, the purpose of training is to transfer and modify knowledge, skills and attitudes. This study, therefore, conceptualise training practice as training needs assessment, training delivery, training evaluation and training transfer.

Ten task characteristics variables and four training variables, which formed the independent and dependent variables respectively, were identified from the literature. 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. Although, Kester and Oludeyi (2017) investigated the relationship between task characteristics and training programmes, the study focused on one variable of training (i.e., feedback). Bossche et al. (2010) focused on the role of feedback in the transfer of training, however, the study considered one variable of task characteristics (i.e., feedback) and training (i.e., training transfer) respectively. 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 practices of construction site supervisors.

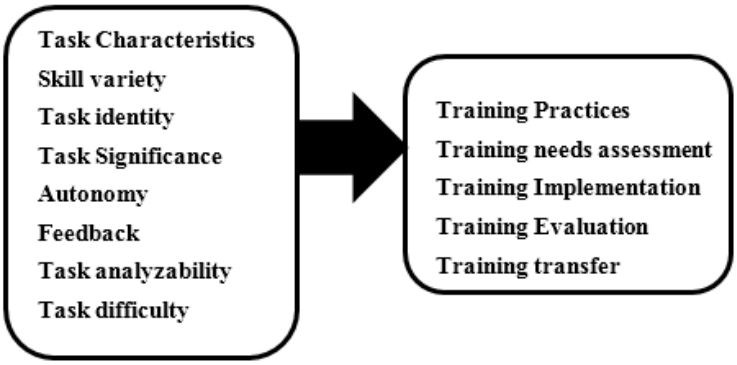


Fig. 1: Relationship between task characteristics and training practices

# RESEARCH DESIGN AND METHODS

This study adopts a cross-sectional survey design with a quantitative research approach. A cross-sectional survey design entails observations being made at one or more points in time (Greener, 2008). A cross-sectional survey design was adopted because the view of more than one participant at a particular time was investigated. In addition, a quantitative research approach was adopted because the variables in this study were quantified and analysed to arrive at results (Apuke, 2017).

## Data collection

The population of this study comprised site supervisors in construction firms in Nigeria. The formula in equation 1 (Grupta and Rangi, 2010) was used in calculating the number of randomly selected construction firms from the lists of 307 construction firms in Nigeria. A total of 171 construction firms were calculated and 50% was added to take care of coverage error due to out of business, duplication rate or non-response rate (Taheroost, 2017) thereby arriving at 257 firms. As a list of professionals working as site supervisors is not in existence, a purposive sampling technique was adopted in the selection of site supervisors. Thus, one site supervisor per firm was selected to eliminate bias. The selected supervisors were those with the highest number of experience in the firm and they were considered because they would have had considerable experiences in the company and thus can give reliable information about the nature of their tasks and the training practices of the firm. A total of 257 questionnaires were distributed with the assistance of seven trained enumerators for 4 months and 218 valid questionnaires representing 85% response rate were retrieved and used for analysis.

$$n = \frac{Z^2 \times N \times \delta_p^2}{e^2(N\text{-}1) + Z^2 \times \delta_p^2} \quad \ldots\ldots\ldots \text{ Equation 1}$$

Where n = Sample size
N = Population frame (307)
e = Level of precision (5%)
Z = Value of standard normal variant at a given confidence level (1.96)
$\delta$ 2p = Standard deviation of the population (0.5)

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 the personal details of the respondents, the second section focused on the prevalent characteristics of site supervisors' tasks while the third focused on the frequency of implementing training in construction firms. Based on the conceptual framework developed in this study, task characteristics consist 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 forms to determine the level of agreement of site supervisors on the prevalent nature of their tasks. See Table 1 for examples of task characteristics statements.

Skill variety consisted of 2 observable variables that described the degree to which the site supervisor's task requires the use of varieties of skills. 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. Task significance was also measured with 3 variables and it described the extent to which site supervisor's task has an 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 tasks. It was measured with 3 variables. 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. Task analyzability, which described the extent to which the site supervisor's task has a clearly defined sequence of steps, was measured with 2 observable variables. Task difficulty, which explained the degree to which the site supervisor's task requires great effort to accomplish, was measured with 2 observable variables. Likewise, task routineness described the degree to which a site supervisor requires a habitual method of carrying out his/her task. This was measured with 2 observable variables. Task complexity is the degree to which the site supervisor's task is made of interconnected or related structures. It was measured with 2 observable variables. 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.

Training practice consists of four major variables namely; training needs assessment, training delivery, training evaluation and training transfer. Questions were asked in statement forms to determine the frequency of training site supervisors in construction firms. Table 1 presents examples of training statements. 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. The second training practice variable named 'training delivery' was also measured as a latent variable and comprised 22 statements explaining areas of training and methods of delivering training. 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. The fourth training practice 'training transfer' emphasised the transfer of what was gained during training to the present job. It comprised 5 statements.

**Table 1: Statements explaining Task Characteristics and Training variables**

| S/N | Variables | |
|---|---|---|
| | Task Characteristics | Statements |
| 1 | Skill Variety | "My task involves the use of a variety of skills to execute them" |
| 2 | Task Identity | "My tasks are complete from the start to finish". |
| 3 | Task Significance | "My task impact people's life". |
| 4 | Autonomy | "My task gives me the chance to use my initiative or judgment in carrying out the task". |
| 5 | Feedback | "My supervisor frequently discusses matters related to my job performance". |
| 6 | Task Analyzability | "My tasks involve a clearly defined sequence of steps". |
| 7 | Task Difficulty | "My tasks require great physical effort to accomplish it". |
| 8 | Task Routineness | "My tasks involve a habitual method of carrying it out". |
| 9 | Task Complexity | "The nature of my task is complex in structure". |
| 10 | Task Structuredness | "My tasks involve the application of a limited number of rules and principles with a well-defined parameter for convergent". |
| | Training | Statements |
| 1 | Training Needs Assessment | "The frequency at which my training needs are determined by the company through personal face to face interview with managers and supervisor is…..". |
| 2 | Training Delivery | "The frequency at which the company sponsors me to workshops, seminars or conferences is….". |
| 3 | Training Evaluation | "The frequency at which the company asks the trainees' managers or supervisor for their assessment of my learning is…" |
| 4 | Training transfer | "The company assigns me duties related to the training I received to a …….". |

To check for the reliability of the scale of the instruments; Cronbach Alpha Coefficient was calculated and found to be 0.98 and 0.86 respectively for task characteristics and training. These values are above the recommended level of 0.7 (Field, 2009), implying that the research instruments are highly reliable.

## Demographic characteristics of respondents

The demographic characteristics of respondents were analysed using percentages. Years of experience was categorised as low, medium and long. 49.5% of respondents have medium experience (6-10 years), 36.2% have low experience (1-5 years) and 14.2% have long experience (above 10 years). This

means that a larger percentage of the respondents have medium experience. The reason may be that the site supervisory position is at the middle management level in organisations, thus most site supervisors will have a medium year of experience. In terms of qualification, 39.4% of respondents possessed Bachelor of Science (B.Sc.), 31.2% possessed Higher National Diploma (HND), 11.5% possessed Postgraduate Diploma (PGD), 11.0% have Masters (M.Sc.) and 6.9% have Ordinary National Diploma (OND). The statistics suggest that the respondents are well educated to give a credible answer to the questions.

## ANALYSIS AND RESULTS

### Prevalent task characteristics of site supervisors

To determine the prevalent nature of site supervisors' tasks, the mean score of each task characteristics was calculated. The result in Table 2 shows that all the respondents agree that all the variables of task characteristics are prevalent in site supervision's task. The mean values were interpreted using the following scales, 1.00-1.49 for strongly disagree; 1.50-2.49 for disagree; 2.50-3.49 for moderately agree; 3.50-4.49 for Agree and 4.50-5.00 for strongly agree.

The implication is that the site supervisor's tasks are frequently characterised with skill variety, task identity, task significance, autonomy, feedback, task identity, task difficulty, task analyzability, task complexity and task significance.

**Table 2: Prevalent Task Characteristics**

| Task Characteristics | MS | Rank | Remarks |
|---|---|---|---|
| Task Significance | 4.24 | 1 | Agree |
| Skill Variety | 4.17 | 2 | Agree |
| Autonomy | 4.17 | 3 | Agree |
| Task Identity | 4.11 | 4 | Agree |
| Feedback | 4.07 | 5 | Agree |
| Task Analyzability | 4.03 | 6 | Agree |
| Task Difficulty | 3.91 | 7 | Agree |
| Task Structuredness | 3.85 | 8 | Agree |
| Task Complexity | 3.78 | 9 | Agree |
| Task Routineness | 3.63 | 10 | Agree |
| Overall Task Characteristics | 4.02 | | Agree |

MS= Mean Score

### Frequency of implementing training practices in construction firms

The frequency of implementing training practices in construction firms was determined by calculating the mean score of each training variable. The result in Table 3 shows that the frequency of implementing training in construction

firms is moderate. The mean values were thus interpreted as follows 1.00-1.49 for Nil; 1.50-2.49 for low; 2.50-3.49 for moderate; 3.50-4.49 for high and 4.50-5.00 for very high. This implies that training (i.e., training needs assessment, training delivery, training evaluation and training transfer) in construction firms is moderately implemented.

**Table 3: Prevalent Training Practices**

| Training Practices | MS | Rank | Remark |
|---|---|---|---|
| Training Transfer | 3.45 | 1 | Moderate |
| Training Delivery | 3.32 | 2 | Moderate |
| Training needs assessment | 3.25 | 3 | Moderate |
| Training Evaluation | 3.25 | 3 | Moderate |
| Overall Training Practices | 3.30 | | Moderate |

MS= Mean Score

## Relationship between task characteristics and training

To determine the relationship between the prevalent 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 a need to test for the 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 an interval scale (Boone & Boone, 2012; Warmbrod, 2014) and thus be analysed using the parametric method. Based on this, each task characteristic and training variable is a composite variable and therefore can be referred to as an interval scale. The criterion for the acceptance of the hypothesis was based on the rule that when the p-value $\leq 0.05$, then it is statistically significant therefore the test rejects the hypothesis but when the p-value is $> 0.05$, then it is not significant, therefore, the test accepts the hypothesis.

When all the task characteristics variables are combined and correlate with the four training variables, the results in Table 4 show that the p-values are less than 0.05; therefore, the test rejects the hypothesis for all the four training variables. This means that a significant and positive relationship exists between combined task characteristics and training variables. This implies that task characteristics influence the 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' tasks, the higher the construction firms measure the training outcome of the site supervisor. The higher the prevalence of task characteristics in site supervisors' tasks, the higher the site supervisor applies the knowledge gained from training to the tasks.

**Table 4: Correlations between task characteristics and training**

| Variables correlated | N | MS | SD | r-value | p-value | Sig | Decision |
|---|---|---|---|---|---|---|---|
| Task Characteristics | | | | | | | |
| Training Needs Assessment | 218 | 3.25 | 0.70 | 0.411** | 0.001 | SS | Reject |
| Training Delivery | 218 | 3.32 | 0.70 | 0.271** | 0.001 | SS | Reject |
| Training Evaluation | 218 | 3.25 | 0.79 | 0.306** | 0.001 | SS | Reject |
| Training Transfer | 218 | 3.45 | 0.81 | 0.329** | 0.001 | SS | Reject |

MS= Mean Score, SD= Standard Deviation, r-value= Correlation Value, SS= Statistically Significant

The results in Table 5 show that the p values for nine task characteristics variables are less than 0.05, therefore the test rejects the hypothesis. 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 analyzability, 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 the relationship between task difficulty and training needs assessment is less 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 a significant positive relationship exists between task difficulty and training needs assessment but no significant relationship with training delivery, evaluation and transfer. This means that, the higher the prevalence of task difficulty in site supervisor's tasks, the higher the construction firm identifies the training needs of the site supervisor.

**Table 5: Correlations between ten task characteristics variables and four training variables**

| Variables correlated | r-value | p-value | Sig | Decision | Variables correlated | r-value | p-value | Sig | Decision |
|---|---|---|---|---|---|---|---|---|---|
| Task characteristics | | | | | Task characteristics | | | | |
| Skill variety | | | | | Task analyzability | | | | |
| Training Needs Assessment | 0.377** | 0.001 | SS | Reject | Training Needs Assessment | 0.253** | 0.001 | SS | Reject |
| Training Delivery | 0.168* | 0.013 | SS | Reject | Training Delivery | 0.195** | 0.004 | SS | Reject |
| Training Evaluation | 0.173* | 0.010 | SS | Reject | Training Evaluation | 0.235** | 0.001 | SS | Reject |
| Training Transfer | 0.288** | 0.001 | SS | Reject | Training Transfer | 0.289** | 0.001 | SS | Reject |

**Table 5 continued: Correlations between ten task characteristics variables and four training variables**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Task identity | | | | | Task difficulty | | | | |
| Training Needs Assessment | 0.292** | 0.001 | SS | Reject | Training Needs Assessment | 0.217** | 0.001 | SS | Reject |
| Training Delivery | 0.209** | 0.002 | SS | Reject | Training Delivery | 0.060 | 0.379 | NS | Accept |
| Training Evaluation | 0.246** | 0.001 | SS | Reject | Training Evaluation | 0.110 | 0.107 | NS | Accept |
| Training Transfer | 0.235** | 0.001 | SS | Reject | Training Transfer | 0.075 | 0.274 | NS | Accept |
| Task significance | | | | | Task routineness | | | | |
| Training Needs Assessment | 0.149* | 0.027 | SS | Reject | Training Needs Assessment | 0.394** | 0.001 | SS | Reject |
| Training Delivery | 0.160* | 0.018 | SS | Reject | Training Delivery | 0.231** | 0.001 | SS | Reject |
| Training Evaluation | 0.168* | 0.013 | SS | Reject | Training Evaluation | 0.237** | 0.001 | SS | Reject |
| Training Transfer | 0.253** | 0.001 | SS | Reject | Training Transfer | 0.186** | 0.006 | SS | Reject |
| Autonomy | | | | | Task complexity | | | | |
| Training Needs Assessment | 0.269** | 0.001 | SS | Reject | Training Needs Assessment | 0.262** | 0.001 | SS | Reject |
| Training Delivery | 0.199** | 0.003 | SS | Reject | Training Delivery | 0.161* | 0.017 | SS | Reject |
| Training Evaluation | 0.208** | 0.002 | SS | Reject | Training Evaluation | 0.181** | 0.007 | SS | Reject |
| Training Transfer | 0.245** | 0.001 | SS | Reject | Training Transfer | 0.148* | 0.029 | SS | Reject |
| Feedback | | | | | Task structuredness | | | | |
| Training Needs Assessment | 0.450** | 0.001 | SS | Reject | Training Needs Assessment | 0.271** | 0.001 | SS | Reject |
| Training Delivery | 0.363** | 0.001 | SS | Reject | Training Delivery | 0.156* | 0.021 | SS | Reject |
| Training Evaluation | 0.412** | 0.001 | SS | Reject | Training Evaluation | 0.175** | 0.010 | SS | Reject |
| Training Transfer | 0.447** | 0.001 | SS | Reject | Training Transfer | 0.171* | 0.011 | SS | Reject |

Note: SS= Statistically Significant, NS= Non-significant, r-value= Correlation Value

## TRAINING MODELS

Four training models were developed using multiple regression analysis.

### Training Needs Assessment Model

Multiple regressions were used to test if task characteristics significantly predicted training needs assessment. The result of the regression in Table 6 revealed a positive relationship between ten task characteristics variables and training needs assessment (R= 0.58). In addition, 10 task characteristics variables explained 33.1% of the variance (R2= 0.33). This implies that task characteristics account for 33.1% variation in training needs assessment.

**Table 6: Model Summary for Training Needs Assessment**

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|
| 0.575 | 0.331 | 0.298 | 0.586 |

Table 7 shows the results of the ANOVA. The ANOVA explains whether the overall model results in a significantly good degree of prediction of the dependent variable. The F ratio (10, 205) = 10.142 is significant at $p < 0.001$. Thus, the regression model predicts training needs assessment significantly well.

**Table 7: Analysis of Variance Table for Training Needs Assessment**

| | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 34.807 | 10 | 3.481 | 10.145 | 0.000 |
| Residual | 70.338 | 205 | 0.343 | | |
| Total | 105.145 | 215 | | | |

The level of contribution of each task characteristics to the model is presented in Table 8. It was found that skill variety ($\beta = 0.25$, $p < 0.001$), task significance ($\beta = -0.21$, $p < 0.001$), Feedback ($\beta = 0.33$, $p < 0.001$) and task routineness ($\beta = 0.21$, $p < 0.001$) significantly predicted training needs assessment.

The implication is that as the site supervisor uses one additional variety of skills, training needs assessment increases by 0.253. In addition, as site supervisor tasks affect people's lives by one unit, training needs assessment of the site supervisor decreases by 0.211. Furthermore, when there is an increase in one unit on feedback from a task done by site supervisors, there is an increase in training needs assessment of the site supervisor by 0.331. Finally, when there is an increase by one unit in the prevalence level of a habitual method of carrying out tasks by the site supervisor, training needs assessment of the site supervisor increases by 0.208.

**Table 8: Coefficient of Task Characteristics on Training Needs Assessment (TNA)**

| Codes | Variables | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| | (Constant) | 0.862 | 0.324 | | 2.657 | 0.009 |
| SV | Skill Variety | 0.253 | 0.067 | 0.263 | 3.770 | 0.000 |
| TI | Task Identity | 0.002 | 0.074 | 0.003 | 0.032 | 0.975 |
| TSI | Task Significance | -0.211 | 0.083 | -0.205 | -2.537 | 0.012 |
| A | Autonomy | 0.057 | 0.091 | 0.052 | 0.629 | 0.530 |
| FB | Feedback | 0.331 | 0.079 | 0.321 | 4.210 | 0.000 |
| TA | Task Analyzability | -0.015 | 0.082 | -0.015 | -0.178 | 0.859 |
| TDI | Task Difficulty | -0.047 | 0.071 | -0.062 | -0.663 | 0.508 |
| TR | Task Routineness | 0.208 | 0.060 | 0.273 | 3.452 | 0.001 |
| TC | Task Complexity | 0.054 | 0.066 | 0.076 | 0.823 | 0.411 |
| TST | Task Structuredness | -0.023 | 0.082 | -0.026 | -0.278 | 0.781 |

"\"$TNA = 0.86 + 0.25(SV) + 0.00(TI) - 0.21(TSI) + 0.06(A) + 0.33(FB) - 0.02(TA) - 0.05(TDI) + 0.21(TR) + 0.05(TC) - 0.02(TST\")$"……. Equation 2

## Training Delivery Model

Multiple regression analysis was also used to test if task characteristics significantly predicted training delivery. The result of the regression in Table 9 indicated a significant positive relationship between nine task characteristics variables and training delivery variables (R = 0.39). Furthermore, the nine task characteristics variables explained 14.9% of the variance in training delivery. The implication is that task characteristics account for 14.9% variance in training delivery.

**Table 9: Model Summary for Training Delivery**

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|
| 0.386 | 0.149 | 0.112 | 0.656 |

The ANOVA result in Table 10 shows that the regression model was significant ($p < 0.001$) at $F(10, 205) = 4.038$ in predicting the relationship between nine task characteristics variables and training delivery. Thus, the regression model predicts training delivery significantly well.

**Table 10: Analysis of Variance Table for Training Delivery**

| | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 15.660 | 9 | 1.740 | 4.038 | 0.000 |
| Residual | 89.195 | 207 | 0.431 | | |
| Total | 104.855 | 216 | | | |

Table 11 shows the contribution of individual task characteristics to the training delivery model. It was found that feedback significantly predicted training delivery (β = 0.34, p < 0.001). This implies that as the level of prevalence of site supervisors' feedback from task increases by one unit, training delivery increases by 0.342.

**Table 11: Coefficient of Task Characteristics on Training Delivery (TD)**

| Codes | Variables | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| | (Constant) | 1.672 | 0.363 | | 4.602 | 0.000 |
| SV | Skill Variety | 0.000 | 0.075 | 0.000 | 0.002 | 0.998 |
| TI | Task Identity | 0.042 | 0.083 | 0.045 | 0.500 | 0.618 |
| TSI | Task Significance | -0.049 | 0.093 | -0.048 | -0.530 | 0.597 |
| A | Autonomy | 0.017 | 0.099 | 0.015 | 0.172 | 0.864 |
| FB | Feedback | 0.342 | 0.085 | 0.333 | 4.036 | 0.000 |
| TA | Task Analyzability | 0.014 | 0.089 | 0.014 | 0.156 | 0.876 |
| TR | Task Routineness | 0.094 | 0.065 | 0.123 | 1.448 | 0.149 |
| TC | Task Complexity | 0.014 | 0.071 | 0.020 | 0.202 | 0.840 |
| TST | Task Structuredness | -0.060 | 0.090 | -0.069 | -0.663 | 0.508 |

"$TD = 1.69 + 0.00(SV) + 0.04(TI) - 0.05(TSI) + 0.02(A) + 0.34(FB) + 0.01(TA) + 0.09(TR) + 0.01(TC) - 0.06(TST)$".....Equation 3

## Training Evaluation

Multiple regression analysis was conducted to investigate if task characteristics variables significantly predicted training evaluation. The result of the regression in Table 12 indicated that a significant positive relationship exists between nine task characteristics variables and training evaluation (R = 0.44). The nine task characteristics variables explain 19.1% of the variance in training evaluation. The implication is that the nine task characteristics variables account for 19.15% variance in training evaluation. Thus other factors account for the remaining 80.9%.

**Table 12: Model Summary for Training Evaluation**

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|
| 0.437 | 0.191 | 0.156 | 0.156 |

Table 13 shows that the regression model is significant F (10, 205) = 4.975, p ˂ 0.001 in predicting the relationship between the nine task characteristics variables and training evaluation. This means that the model predicts training evaluation significantly well.

**Table 13: Analysis of Variance Table for Training Evaluation**

| | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 25.621 | 9 | 2.847 | 5.436 | 0.000 |
| Residual | 108.402 | 207 | 0.524 | | |
| Total | 134.023 | 216 | | | |

The contribution of each nine task characteristics variable to training evaluation is presented in Table 14. It was discovered that feedback significantly predicted training evaluation (ß = 0.46, p < 0.001). This means that as the level of prevalence of feedback from the task of a site supervisor increases by one unit, training evaluation increases by 0.462.

**Table 14: Coefficient of Task Characteristics on Training Evaluation (TE)**

| Code | Variables | Unstandardized Coefficients | | Standardized t Coefficients | | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| | (Constant) | 1.236 | 0.401 | | 3.085 | 0.002 |
| SV | Skill Variety | -0.029 | 0.083 | -0.027 | -0.353 | 0.724 |
| TI | Task Identity | 0.092 | 0.092 | 0.088 | 1.005 | 0.316 |
| TSI | Task Significance | -0.092 | 0.102 | -0.080 | -0.903 | 0.367 |
| A | Autonomy | -0.010 | 0.109 | -0.008 | -0.090 | 0.929 |
| FB | Feedback | 0.462 | 0.094 | 0.397 | 4.938 | 0.000 |
| TA | Task Analyzability | 0.056 | 0.099 | 0.052 | 0.572 | 0.568 |
| TR | Task Routineness | 0.077 | 0.071 | 0.089 | 1.078 | 0.283 |
| TC | Task Complexity | 0.025 | 0.078 | 0.031 | 0.324 | 0.746 |
| TST | Task Structuredness | -0.075 | 0.100 | -0.076 | -0.754 | 0.451 |

$$"TE = 1.24 - 0.03(SV) + 0.09(TI) - 0.09(TSI) - 0.01(A) + 0.46(Feedback) + 0.06(TA) + 0.08(TR) + 0.03(TC) - 0.08(TST)" \ldots\ldots\ldots\ldots Equation4$$

## Training Transfer

The fourth multiple regression model was conducted to test if task characteristics variables significantly predicted training transfer. The result of the regression in Table 15 shows that there is a significant positive relationship between nine task characteristics variables and training transfer. Table 15 also indicated that 22.2% of the variation in training transfer can be explained by the model containing nine task characteristics variables (R2 = 0.22). This means that task characteristics variables account for 22.2% changes in training transfer. Other factors account for the remaining 77.8% variance.

**Table 15: Model Summary for Training Transfer**

| R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|
| 0.471 | 0.222 | 0.188 | 0.727 |

Table 16 revealed that the regression model is significant F (9, 207) = 6.573, p < 0.001) in predicting training transfer. The implication is that the regression model predicts training transfer significantly well.

**Table 16: Analysis of Variance Table for Training Transfer**

| | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 31.292 | 9 | 3.477 | 6.573 | 0.000 |
| Residual | 109.505 | 207 | 0.529 | | |
| Total | 140.800 | 216 | | | |

Table 17 shows the contribution of individual task characteristics to the training transfer model. It was found that feedback (β = 0.43, p ˂ 0.001) significantly predicted training transfer. The implication is that as feedback from the site supervisor's task becomes more prevalent by one unit, training transfer increases by 0.434.

**Table 17: Coefficient of Task Characteristics on Training Transfer (TT)**

| Codes | Variables | Unstandardized Coefficients | | Standardized t Coefficients | | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| | (Constant) | 0.877 | 0.403 | | 2.179 | 0.030 |
| SV | Skill Variety | 0.113 | 0.083 | 0.101 | 1.359 | 0.176 |
| TI | Task Identity | -0.012 | 0.092 | -0.011 | -0.125 | 0.900 |
| TSI | Task Significance | -0.006 | 0.103 | -0.005 | -0.055 | 0.956 |
| A | Autonomy | -0.001 | 0.109 | 0.000 | -0.005 | 0.996 |
| FB | Feedback | 0.434 | 0.094 | 0.364 | 4.616 | 0.000 |
| TA | Task Analyzability | 0.173 | 0.099 | 0.155 | 1.750 | 0.082 |
| TR | Task Routineness | 0.043 | 0.072 | 0.049 | 0.606 | 0.545 |
| TC | Task Complexity | -0.027 | 0.078 | -0.032 | -0.339 | 0.735 |
| TST | Task Structuredness | -0.088 | 0.100 | -0.088 | -0.883 | 0.379 |

$$"TT = 0.88 - 0.11(SV) - 0.01(TI) - 0.01(TS) - 0.00(A) + 0.43(FB) + 0.17(TA) + 0.04(TR) - 0.03(TC) - 0.09(TST)" \ldots\ldots\ldots\ldots Equation5$$

# DISCUSSION OF RESULTS

The result from the hypothesis shows that there is a significant relationship between nine task characteristics variables and four training practices. This means that the higher the prevalence of task characteristics in site supervisors' task, the higher the systematic procedures for carrying out training 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 task characteristics and training variables could contribute to the differences in the findings of this study and that of Morgeson and Humphrey. Morgeson and Humphery conceptualised task characteristics as autonomy, task variety, task significance, task identity and feedback. In addition, Morgeson and Humphery divided autonomy into three 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 respondents while Morgeson and Humphery focused on job incumbents.

Another major finding in this study is that task characteristics variables namely; skill variety, task significance, feedback and task routineness predicted training needs assessment of site supervisors. However, task significance and routineness show a negative influence. The finding supports Rausch's (2018) study where task characteristics predicted learning. Although, the variables were different from the variables of this study, for example, feedback, novelty, the 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.

In the prediction of training delivery from task characteristics, feedback significantly predicted training delivery. This implies that the higher the site supervisors receive feedback on the task executed, the higher the construction firm delivers training to them. Giving feedback will assist construction firms to identify training needs and ways of delivering the training. Kester and Oludeyi (2017) emphasised the usefulness of feedback in training delivery when they concluded that feedback is useful in training delivery. The finding in this study thus supports that of Kester and Oludeyi.

The modelling of training evaluation from task characteristics shows that only feedback significantly predicted training evaluation. Thus, an increase in the site supervisor's feedback will lead to an increase in training evaluation. This suggests that feedback is useful in training evaluation. Kester and Oludeyi (2017) shared this view also when they concluded that feedback is useful in training evaluation.

In modelling the relationship between feedback and training transfer, the study discovered that feedback significantly predicted training transfer. This means that an increase in the rate of giving feedback to a supervisor on tasks executed will lead to an increase in the rate at which a site supervisor will apply knowledge gained from training to the task. The result of this study collaborates with that of Bossche et al. (2010) in which feedback influenced training transfer. Site supervisors must be given feedback on tasks executed in order to transfer the skills gained to the task. Feedback is useful for reviewing the activities and performance of a task. It is also useful in comparing previous training to the recent one. This will assist in determining the transfer of training outcome to the task.

## CONCLUSION AND RECOMMENDATIONS

This study investigated the relationship between task characteristics of site supervisors and training in construction firms in Nigeria and further developed models for predicting training from site supervisors' tasks. Pearson product correlation and multiple regression analysis were employed in determining the relationship and developing the models. The finding shows that a significant positive relationship exists between task characteristics and training; in addition, task characteristics predicted training. Therefore, the study concludes that the prevalent nature of site supervisors' task influences training in construction firms, hence task characteristics predict training practices in construction firms. Improving the training of site supervisors in construction firms requires the consideration of task characteristics in designing the training programme. This can be achieved when designing the training module of site supervisors.

The study has filled a gap in knowledge in the construction industry by developing training models from the task characteristics of site supervisors. Construction firms can use the models in forecasting the training needs, training delivery, training evaluation and training transfer of site supervisors. This will assist the firms in budgeting and allocation of resources for the training of site supervisors. Proper budgeting and allocation of resources will prevent the lack of funds for training, hence training of site supervisors will be adequate. Furthermore, 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 practices discovered in this study to train their site supervisors to have sustainable development in their organisation.

This study utilised task characteristics to predict training models. The models revealed that task characteristics account for certain percentages in the training models while other factors not considered in this study account for the remaining percentages. Future studies should therefore consider other characteristics such as knowledge, culture and social characteristics in developing training models to establish sustainable solutions to the issue of inadequate training in the construction industry.

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