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Assessment of Working Environment Factors Influencing Construction Workers' Performance in the Nigerian Construction Industry

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Abstract: The working environment plays a crucial role in determining the performance of employees in the construction industry. Factors such as physical conditions, ergonomics, and the social and cultural atmosphere significantly impact how well employees carry out their tasks. Unfortunately, these factors have been negatively affecting the performance and productivity of the Nigerian construction industry. This study aims to assess the working environment factors that influence construction workers' performance in Nigeria. A quantitative research approach was adopted, utilizing a five-point Likert-based questionnaire for data collection. A total of 200 questionnaires were distributed, resulting in 187 valid responses, which is considered adequate for analysis. The results indicate that 11 out of the 16 hypothesized barriers were statistically significant, surpassing the set threshold of 3.5. The most significant factors influencing construction workers' performance in the working environment were found to be disputes among workers, poor weather conditions, equipment failure, changes in orders during unpredictable execution, and major rework due to unforeseen conditions. Through factor analysis, the barriers were categorized into three components: "Physical and Social-related barriers," "Operational-related barriers," and "Welfare-related barriers." This study highlights the paramount importance of working conditions in determining employee performance and recommends the development and implementation of strategies to mitigate working condition challenges in the construction industry. The findings of this study can be applicable to construction industries in other countries with similar characteristics to Nigeria.

Keywords: *Construction, Construction-workers, Environment, Nigeria, Performance*

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1. Introduction

The construction industry plays a significant role in a nation's economy, contributing a substantial percentage to the Gross Domestic Product (GDP) both globally and in Nigeria (World Economic Forum, 2018; Olanrewaju et al., 2020). Despite its economic importance, the construction industry faces various productivity challenges, particularly related to the working environment of its workers. These challenges are prevalent in both developed and developing countries, and they significantly impact the performance of construction workers, especially those with low skills (Naoum, 2016).

The performance of employees in the construction industry is influenced by multiple factors, including their well-being, safety, access to resources, and the overall work environment (Leblebici, 2012; Naharuddin & Sadegi, 2013). A conducive physical workplace encourages consistent and sincere employee engagement, minimizing absenteeism, job delays, and other unfavorable aspects (Chika & Dominic, 2017). Effective communication and motivation strategies also play a crucial role in inspiring employees to be highly committed to their work (Sprinkle, 2000; Kreitner & Kinicki, 2010; Gupta & Shaw, 2014).

The successful completion of construction projects within the agreed-upon timeframe and budget is a key measure of project success. However, the absence of a positive work environment can lead to a decline in employee performance (Chika & Dominic, 2017). Adverse work environments can cause chronic stress

among employees, necessitating the identification and mitigation of such factors (Noble, 2009).

Several indicators of the working environment that impact construction workers' performance have been identified in the literature. These include factors such as lighting conditions (Hyder, 2016), risks and safety measures (Parida et al., 2016), access to medical services (Aina & Adesanya, 2015), provision of training facilities (Ikediashi et al., 2012), challenges posed by environmental conditions (Venugopal, 2016), availability and maintenance of equipment (Attar et al., 2012; Sinha, 2015), job execution errors and delays (Enshassi et al., 2007; Zhang & Huo, 2015), coordination and cooperation issues (Jarkas & Radosavljevic, 2013; Aina & Adesanya, 2015), transportation concerns (Adamu et al., 2011; Funso et al., 2016), and other related barriers.

In the Nigerian construction industry, there is a lack of studies investigating the factors that affect working conditions and subsequently influence the performance of construction workers. The existing literature is limited, and there are methodological gaps that need to be addressed through the adoption of additional analytical tools. Therefore, this study aims to assess the working environment factors that influence the performance of construction workers in the Nigerian construction industry.

This study has two primary objectives: 1) to identify the barriers affecting the working conditions of construction workers through a review of related literature, and 2) to assess the identified barriers in the Nigerian construction industry. The findings of this study will contribute to the limited literature on this topic and provide insights into the barriers that affect the performance of construction workers in Nigeria.

Table 1: Summary of identified working environment underlying barriers

S.N.	Underlying Barriers	Authors
1	Lack of free/subsidized transportations for workers	Funso *et al*. (2016); Akinsiku and Akinsulire (2012)
2	Lack of motivating vehicles for construction workers	Aina and Adesanya (2015); Abdulsalam *et al*. (2012)
3	Lack of free food vouchers for workers	Kuroshi and Lawal (2014); Attar *et al*. (2012)
4	Lack of free clinical offices for construction workers	Parida *et al.* (2016); Chandra (2015)
5	Lack of skill acquisition platforms for workers	Ikediashi *et al*. (2012); Wong (2010)
6	Lack of issuance of preparing certificate for workers	Ogwu (2015); Aniekwu and Ozochi (2010)
7	Poor weather condition	Venugopal (2016); Schwarzkopf (2004)
8	Obsolete machines for site operations	Kamar *et al*. (2014); Alinaitwe *et al*. (2006)
9	Plants and equipment failure	Funso *et al*. (2016); Sinha (2015)
10	Major rework due to unpredicted conditions	Enshassi *et al*. (2007); Alinaitwe *et al*. (2006)
11	Overcrowd of workers on site	Jarkas and Radosavljevic (2013); Chandrasekar (2011)
12	Change in orders during project execution	Moselhi *et al*. (2005); Jarkas and Radosavljevic (2013)
13	Delay in supply of materials to site	Yerramreddy (2014); Enshassi *et al*. (2007)
14	Dispute among workers	Zhang and Huo (2015); Doloi *et al*. (2012)
15	Poor lightning	Hyder (2016)
16	Accidents and Injuries	Parida *et al*. (2016); Hughes and Ferrett (2016)

2. Materials and methods

This study adopted a quantitative research approach to investigate the working environment barriers affecting construction workers' performance in the Nigerian construction industry. The quantitative research approach was chosen to collect data and measure the effects of variables. Data collection involved the use of a questionnaire. According to Saunders et al. (2016), the quantitative approach enables the collection of numerical data for statistical analysis.

A total of 200 questionnaires were randomly distributed among built environment professionals in Lagos, Nigeria. Lagos was selected as the study location due to the high level of construction activities in the area. The questionnaire was designed using a five-point Likert scale to capture the respondents' opinions.

The questionnaire was created using Google Forms and distributed electronically to the professionals. Out of the 200 questionnaires distributed, 187 properly filled questionnaires were received and deemed suitable for analysis. This sample size was considered adequate based on previous construction-related studies (Bello et al., 2023a; Okafor et al., 2022; Olanrewaju et al., 2020).

Data analysis was conducted using descriptive statistics, including mean item score and standard deviation, to provide an overview of the responses. Additionally, inferential statistics, specifically factor analysis, were utilized to identify underlying factors or components within the data. The reliability of the data was assessed using Cronbach's Alpha, which yielded a value of 0.843, indicating satisfactory reliability based on the guideline provided by Maree and Pietersen (2016).

3. Results and discussion

3.1. Background of the respondents

A research report includes descriptive statistics, which provide a broad overview of the data collected by the researcher and its nature before subjecting it to additional analyses based on the research objectives (Bamgbade, 2019). Given the nature of the study, skilled and knowledgeable construction professionals with extensive experience at various management and supervisory levels were required to respond to the questionnaires to gather the necessary data to achieve the study's objectives. The results for each of the four variables are presented in detail in Table 4.1.

In terms of the respondents' professional background, Table 4.1 shows that the highest percentage of respondents (29.41%) were Quantity surveying professionals, followed by (27.81%) of respondents who were Builders. Furthermore, it indicates that a significant number of respondents held at least a BTech/Master's degree in relevant fields (58.29%), while (14.97%) of respondents had an HND/PGD in relevant fields. This suggests that these respondent categories were knowledgeable about the various working conditions discussed. Regarding years of experience, Table 4.1 reveals that the highest percentage of respondents (43.85%) had 11-15 years of practice, followed by (22.99%) of respondents with 6-10 years of practice. These findings indicate that the responses from the respondents can be considered valid in providing answers to the questionnaires. Additionally, 67.91% of the respondents worked in private organizations, while 32.09% worked in government institutions.

Table 2: Demographics of Respondents

Respondents Profile	Frequency	Percentage
Architect	37	19.79
Builder	52	27.81
Engineer	43	22.99
Quantity surveyor	55	29.41
Total	**187**	**100.00**
HND/PGD	28	14.97
Bachelor Degree	109	58.29
Master’s Degree	42	22.46
Doctorate Degree	8	4.28
Total	**187**	**100.00**
Less than 5 years	18	9.63
6-10 years	43	22.99
11-15 years	82	43.85
16-20 years	28	14.97
21 years above	16	8.56
Total	**187**	**100.00**
Government	60	32.09
Private	127	67.91
Total	**187**	**100.00**

3.2. Working environment influencing factors

The results revealed the working environment factors that influence construction workers' performance in the Nigerian construction industry. A total of 16 influencing factors were identified, analyzed, and ranked accordingly. Table 4.2 presents the mean score and standard deviation of the sixteen major constructs of working environment factors that influence construction workers' performance. The five highly significant and critical factors include Dispute among workers (4.384), Poor weather conditions (4.342), Plants and equipment failure (4.258), Changes in orders during unpredicted execution (4.229), and Major rework due to unpredicted conditions (4.219). In contrast, the five less significant working environment factors are Overcrowding of construction workers (3.482), Delay in the supply of materials to the site (3.221), Lack of free/subsidized transportation for workers (2.984), Lack of issuance of training certificates for workers (2.861), and Lack of free food vouchers for workers (2.463).

3.3. Preliminary test for determining factor analysis adequacy

Factor analysis is a statistical technique utilized to uncover underlying patterns or relationships among a set of variables. The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity (BTS) are statistical tests employed to evaluate the appropriateness of data for factor analysis. The KMO test assesses the proportion of variance that can be explained by the underlying factors among all the variables. A KMO value above 0.5 is considered suitable for factor analysis (Field, 2013). Bartlett's test of sphericity examines the null hypothesis that the correlation matrix is an identity matrix, implying no association among the variables. A significant p-value ($p < 0.05$) from Bartlett's test indicates that the correlation matrix is not an identity matrix, allowing for factor analysis to be conducted (Field, 2013). Both the KMO test (0.782) and BTS (0.000*) demonstrated adequacy for factor analysis, as shown in Table 4. Similar construction-related studies have employed this approach (Bello et al., 2023b; Olanrewaju et al., 2020).

Table 5 shows the rotated component matrix for the 16 identified working environment factors affecting the performance of construction workers. Similarly, the variance percentage of each component is shown in Table 5. There are several different methods of factor analysis, including principal component analysis, common factor analysis, and principal axis factoring. The most commonly used method is principal component analysis, which aims to identify a small number of uncorrelated factors that explain the majority of the variance in the data. The principal component analysis (PCA) method was adopted

for the study. Three components were extracted accounting for 68.18% variance from the total 16 variables.

Table 3: Working Environment Underlying Barriers

Code	Underlying Barriers	MIS	SD	t-value = 3.5			R
				t	df	Sig	
B1	Dispute among workers	4.384	0.758	6.778	186	0.000	1
B2	Poor weather condition	4.342	0.936	8.563	186	0.000	2
B3	Plants and equipment failure	4.258	0.653	7.589	186	0.001	3
B4	Change in orders during project execution	4.229	1.211	7.578	186	0.001	4
B5	Major rework due to unpredicted conditions	4.219	0.611	8.444	186	0.011	5
B6	Obsolete machines for site operations	4.111	0.811	8.497	186	0.000	6
B7	Lack of motivating vehicles for construction workers	3.936	0.768	12.364	186	0.004	7
B8	Poor lightning	3.867	1.514	8.847	186	0.042	8
B9	Lack of free clinical offices for construction workers	3.619	0.924	12.401	186	0.028	9
B10	Accidents and Injuries	3.612	1.036	9.719	186	0.015	10
B11	Lack of skill acquisition platforms for workers	3.563	1.021	10.468	186	0.017	11
B12	Overcrowd of workers on site	3.482	1.417	9.996	186	0.056	12
B13	Delay in supply of materials to site	3.221	1.978	7.888	186	0.257	13
B14	Lack of free/subsidized transportations for workers	2.984	0.862	11.256	186	0.487	14
B15	Lack of issuance of preparing certificate for workers	2.861	0.838	10.514	186	0.576	15
B16	Lack of free food vouchers for workers	2.463	1.121	11.460	186	0.627	16

Table 4: KMO and Bartlett's Test for Working Environment Barriers

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.782
Bartlett's Test of Sphericity	Approx. Chi-Square	753.153
	Df	190.000
	Sig.	0.000

Table 5: Rotated Component Matrixa and Variance Percentage

Component	Barriers	Component			% of Variance
		1	2	3	
B7	Lack of motivating vehicles for construction workers	0.886			***38.43%***
B8	Poor lightning	0.852			
B1	Dispute among workers	0.815			
B2	Poor weather condition	0.784			
B11	Lack of skill acquisition platforms for workers	0.746			
B12	Overcrowd of workers on site	0.711			
B15	Lack of issuance of preparing certificate for workers		0.914		***50.91%***
B10	Accidents and Injuries		0.888		
B13	Delay in supply of materials to site		0.816		

B3	Plants and equipment failure	0.799		
B4	Change in orders during project execution	0.752		
B5	Major rework due to unpredicted conditions	0.692		
B6	Obsolete machines for site operations	0.665		
B9	Lack of free clinical offices for construction workers		0.867	***68.18%***
B14	Lack of free/subsidized transportations for workers		0.786	
B16	Lack of free food vouchers for workers		0.692	

3.4. Extracted components discussions

Component 1: Physical and Social related barriers

The physical environment of a workplace, such as temperature, lighting, and ergonomics, can have a significant impact on employee well-being and productivity. For example, a poorly lit or excessively hot or cold workplace can lead to discomfort and decreased productivity. The social environment of a workplace, such as the culture, communication, and relationships among employees, can also have a significant impact on employee well-being and productivity. A positive social environment, characterized by trust, mutual respect, and open communication, can lead to higher levels of employee engagement and motivation. A negative social environment, characterized by conflict, lack of trust, and poor communication, can lead to decreased morale, increased absenteeism, and higher turnover rates. As shown in Table 5, factors (Lack of motivating vehicles for construction workers, Poor lightning, Dispute among workers, Poor weather condition, Lack of skill acquisition platforms for workers, and overcrowd of workers on site) under this category are in consonance with previous studies (Aina & Adesanya (2015); Zhang & Huo (2015); Hyder (2016); Venugopal (2016); Ikediashi et al. (2012); Jarkas & Radosavljevic (2013)). These studies have in their various studies established that the identified barriers are critical to the performance of employees which requires adequate measures to curb the menace.

Component 2: Operational related barriers

The barriers identified under this category namely, Lack of issuance of preparing certificate for workers, Accidents and Injuries, Delay in supply of materials to site, Plants and equipment failure, Change in orders during project execution, Major rework due to unpredicted conditions, and Obsolete machines for site operations. These barriers represented the highest contributing factors towards influencing performance of workers in the construction industry. Other studies have also studied these barriers (Funso et al. (2016); Parida et al. (2016); Ogwu (2015); Yerramreddy (2014); Kamar et al. (2014); Enshassi et al. (2007); Moselhi et al. (2005)).

Operational decisions and actions can greatly influence the working environment for employees. Implementing efficient processes and systems can lead to a more streamlined and productive work environment. Providing adequate resources, such as equipment and tools, can improve the work conditions and make tasks easier for employees. Encouraging open communication and collaboration can foster a positive and supportive work culture. Prioritizing safety measures and promoting a safe working environment can improve employee well-being and reduce the risk of accidents. Providing opportunities for training and development can help employees feel valued and motivated, leading to a more engaged and productive workforce. Implementing flexible working arrangements, such as remote or flexible hours, can improve work-life balance and employee satisfaction. On the other hand, poor operational decisions and actions can negatively impact the working environment, leading to low morale, decreased productivity, and high turnover rates.

Component 3: Welfare related barriers

Welfare policies and programs can have a significant impact on the working environment. They can provide support and resources to employees, helping to promote a positive and productive work culture. One example of this is the implementation of employee benefits such as healthcare, retirement plans, and paid time off. These benefits can help to reduce stress and financial burdens for employees, leading to increased job satisfaction and motivation. Additionally, welfare policies such as parental leave and flexible working arrangements can help to support employees with families, promoting a more inclusive and equitable work environment. This can also lead to increased employee retention and recruitment. Employee welfare programs such as mental health support and employee assistance programs can also help to address issues such as stress and burnout, promoting a healthier and more resilient workforce. Overall, the implementation of welfare policies and programs can have a positive impact on the working environment by supporting the well-being and productivity of employees.

4. Conclusion

This research aimed to examine the impact of working environment and conditions on construction workers' performance in the Nigerian construction industry. The findings, derived from a combination of literature review and empirical analysis, indicate that several significant factors of the working environment influence construction workers' performance. These factors include disputes among workers, poor weather conditions, plants and

equipment failure, changes in order during unpredicted execution, and major rework due to unpredicted conditions. Through factor analysis, the identified barriers were categorized into three components: "Physical and Social related barriers," "Operational related barriers," and "Welfare related barriers."

Based on these findings, the study recommends the implementation of appropriate and adequate working environment policies to address the identified issues. By addressing factors such as dispute resolution, organizational stability, organizational culture, favoritism, and sociocultural aspects, the performance of construction workers can be enhanced. These recommendations are crucial for improving workers' performance and overall productivity in the construction industry.

This research contributes both theoretically and practically. Theoretically, it fills the existing knowledge gap and serves as a valuable resource for academia. Practically, it offers insights into the challenges associated with working conditions that impact workers' performance, thereby aiding industry professionals in effectively managing and mitigating these challenges. Additionally, the study suggests that government bodies can leverage the research outcomes to develop policies aimed at enhancing workers' conditions.

However, it is important to acknowledge the limitations of this research. Firstly, the study's scope was confined to construction workers in Lagos State, Nigeria, limiting the generalizability of the results to other cities and countries unless they share similar characteristics. Secondly, this research utilized a quantitative research approach, and the adoption of a mixed-method design could provide further insights and a more comprehensive understanding of the subject matter.

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