RESEARCH ARTICLE

JENER Journal of Empirical and Non-Empirical Research
Volume 2, Issue 3, Page 126-131 | Article No. 18
DOI: 10.4898/jener.v2i3.a18
ISSN: 7895-9216
Journal homepage: https://jenerjournal.com
Journal email: editor@jenerjournal.com

JENER Journal
JENER Journal of Empirical and Non-Empirical Research

Effects of the Challenges of Sustainable Construction Practices On Labour Productivity

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ARTICLE INFORMATION

Article history:
Published: March 2026

Keywords:
Sustainable Construction
Labour Productivity
Non-monetary incentives
Gombe metropolis
Nigeria

ABSTRACT

Recently, there has been increasing recognition of the pivotal role played by labour in achieving organizational objectives, necessitating fair compensation commensurate with individual contributions. This study seeks to explore how non-monetary incentives impact labour productivity at construction sites in Gombe metropolis, Nigeria, emphasizing the importance of acknowledging and rewarding labour based on their unique inputs. Despite several ambitious urban development goals, labor efficiency still remains an issue, underscoring the need for a deeper understanding of sustainable construction technologies and their effects on productivity. Utilizing structured questionnaires and quantitative analysis through SPSS version 21, data was gathered from industry professionals in Gombe metropolis's construction sector. Results indicate significant obstacles such as a shortage of skilled labour, resistance to change, and regulatory barriers affecting sustainable practices and productivity. However, factors like training initiatives, technological advancements, and collaborative planning show practical steps in enhancing productivity. The study underscores the importance of project managers devising strategies to address inefficiencies, optimize labour utilization, and cultivate non-monetary motivators to boost productivity. Ultimately, this research sheds light on the intricate relationship between sustainable construction practices and labour efficiency in Gombe metropolis, Nigeria, offering insights to enhance project performance, industry competitiveness, and sustainable development in the region. Recommendations include a deeper understanding of factors impacting labour productivity to formulate strategies for efficiency improvement, thus enhancing project outcomes and competitiveness within the construction sector.

1. Introduction

In recent years, the global construction industry has witnessed a paradigm shift towards sustainability, driven by the increasing awareness of environmental concerns and the need for responsible resource management (Nwanegbo et al., 2017). Sustainable construction practices aim to minimize the negative impact of construction activities on the environment, society, and the economy (Hasan et al., 2018). As the construction industry in Gombe metropolis, Nigeria, continues to grow, there is a pressing need to evaluate the impact of sustainable construction practices on various facets of the construction process, particularly labour productivity (Hasan et al., 2018). Construction contractors must have good productivity to operate profitably, which evanescently converts resources into marketable products (Kulakov et al., 2023).

Furthermore, the productivity of contractors has multiple impacts on their own business and the construction industry as a whole, as well as on other industries and the national economy (Ofori, 2024). At the construction projects level, improving the productivity of construction contractors reduces time and realization costs, allows for more competitive bids in job tenders, and creates the space to increase quality (Gurmu, 2021). Productivity is positively correlated with the percentage of plan execution, depicting the measure of changes in the work schedule (Yu et al., 2024), or the sustainability of the initially set goals. Extending the realization deadline reduces the profit of construction contractors and delays the possibility for clients to use the results of their investment thus reducing their profitability (Goodarzizad et al., 2023).

In Nigeria, construction investment accounts for over 60% of the Gross Fixed Capital Formation (GFCF) which is the total national investment (Dlakwa and Culpin, 2010). The industry is also seen as the barometer for the performance of the economy in most developing countries (Fitriani and Ajayi, 2023a). Adedeji (2008) observes that the building industry being a subset of the construction industry is one of the most important sectors of the Nigerian economy. Gombe metropolis, being one of the key centres of construction activity in Nigeria, faces challenges such as rapid urbanization, resource scarcity, and environmental degradation (Kineber et al., 2023).

Additionally, this necessitates a comprehensive understanding of the potential benefits and challenges associated with the adoption of sustainable construction practices, specifically their influence on labour productivity. Labor productivity is a critical

factor in construction projects, directly affecting project timelines, costs, and overall project success (Manoharan et al., 2023; Rehman et al., 2023). the construction industry in Gombe metropolis, Nigeria, has experienced significant growth in recent years, driven by urbanization, infrastructure development, and economic expansion (Rehman et al., 2023). This growth has also brought forth challenges related to environmental sustainability, resource management, and social well-being.

Likewise, In response to these challenges, there has been an increasing emphasis on sustainable construction practices as a means to balance the developmental needs of the region with the preservation of its natural and human resources (Rehman et al., 2023). This study seeks to assess the effect of sustainable construction practices on labour productivity in Gombe metropolis, Nigeria. Labor productivity is a critical performance indicator in construction projects, influencing the efficiency and success of the entire construction process (Blay Jnr et al., 2023). Sustainable construction practices encompass a range of strategies, including the use of eco-friendly materials, energy-efficient technologies, waste reduction measures, and the promotion of a safe and healthy working environment (Blay Jnr et al., 2023; Watfa et al., 2023).

Therefore, Through evaluating the relationship between sustainable construction practices and labour productivity, this study aims to provide valuable insights for stakeholders in the construction industry, including policymakers, contractors, and developers (Iqbal et al., 2021). Also, understanding how sustainable practices influence labour productivity can contribute to informed decision-making, leading to more resilient and environmentally responsible construction projects in Gombe metropolis and beyond. Through this comprehensive approach, the research aims to contribute to the existing body of knowledge on sustainable construction and offer practical recommendations for enhancing labour productivity in the context of Gombe metropolis, Nigeria.

1.1 Statement of the Problem

The statement would highlight the gap in the current knowledge base on the relationship between sustainable construction practices and labour productivity in the Nigerian construction industry, particularly in the context of Gombe metropolis (Okoh et al., 2023). Despite the growing interest in sustainability in the construction industry, there is limited research specifically examining the relationship between sustainable construction practices and labour productivity (Ahmed et al., 2021; Oguzie et al., 2023; Roche, 2023). Previous studies have been developed in other countries, without considering the unique challenges and opportunities in the Gombe metropolis construction industry (Ölkers et al., 2023).

This study seeks to address this issue by assessing sustainable construction practices in Gombe metropolis. While existing literature extensively examines the quantitative aspects of sustainable construction practices and their impact on labour productivity, there remains a significant research gap in understanding the nuanced and often overlooked realm of psychological well-being among construction workers in Gombe metropolis, Nigeria. Despite the growing emphasis on sustainable practices in the construction industry, there is a paucity of research exploring how these initiatives influence the mental and emotional health of the labour force.

Additionally, (Kineber et al., 2023) explored the broader implications of sustainable construction , there exists a research gap in understanding how the adoption of sustainable practices directly influences the efficiency and productivity of labour in the construction industry in this specific geographic and socio-economic setting. This research gap presents a significant knowledge void that requires focused investigation to contribute valuable insights for enhancing sustainable construction practices and optimizing labour productivity in the construction sector in Gombe metropolis, Nigeria. This research gap raises important questions about the potential correlation between sustainable construction practices and the psychological well-being of workers in Gombe metropolis. The workers experiencing heightened job satisfaction, reduced stress levels, or an increased sense of purpose when engaged in sustainable construction projects? How do factors such as workplace culture, leadership styles, and the overall work environment interact with sustainable practices to influence the mental health of construction labourer's and promote a holistic approach to sustainable development that prioritizes the well-being of the workforce.

1.2 Aim and Objectives

- To identify the factors that influence sustainable construction practices on labour productivity in the study area.
- To determine the effects of the challenges of sustainable construction practices on labour productivity in the study area.

2. Research Methodology

2.1 Research Design

The study adapts descriptive and exploratory design because it will use objective methods to uncover facts about its background and problems. The most appropriate approach for this study is quantitative, as numerical data will be collected and analysed. This research adopted a Survey strategy using a questionnaire as an instrument of data collection. Hence, as stated by Inuwa (2014), this research design is mainly quantitative (exploratory and descriptive).

2.2 Research Approach

The study adopted a quantitative approach because it will use objective methods to uncover facts about its background and problems. The most appropriate approach for this study is quantitative, as numerical and qualitative data used data collected and analysed.

2.3 Research Strategy

This research adopted a Survey strategy using a questionnaire as an instrument of data collection. The Questionnaire includes instructions for completion, response alternatives where appropriate and specific means for recording responses (Frazer & Lawley, 2000). Questions in a questionnaire were open-ended, close-ended or a mixture of the two (Frazer & Lawley, 2000). There are four main methods of questionnaire administration. These include mail, personally administered, telephone, and internet

questionnaires (Frazer and Lawley, 2000); therefore, this study adopted the personally administered questionnaire, the questionnaire was developed based on the stated objectives of the research.

2.4 Study Population

The study population is the target respondents to study that meet the requirement to provide information (data). For this stu dy, the target population, are professionals in the Gombe metropolis construction industry.

2.5 Sample Frame

It is a list consisting of the units of population. The sample frame is the total number of items of the study population. The sample frame of this study is the total number of professionals in the construction industry in Gombe metropolis, Nigeria, which is 109 professionals registered professional in Gombe metropolis, 2024.

Table 1: Sample frame of the study

S/N	Professionals	Sample frame
1	Builders	25
2	Quantity surveyors	45
3	Architects	18
4	Civil Engineers	21
	Total	109

3.6 Sample size

The sample size is an important feature of any empirical study that aims to make inferences about a population from a sample. In practice, the sample size to be used in a study is determined based on the expense of data collection and the need for sufficient statistical power (Obst, Shakespeare-Finch, Krosch, & Rogers, 2019). Therefore, to determine the sample size for this research, Krejcie and Morgan's table of determining sample size was adopted. Since the population size of this study area is 109, as sh own in the sample frame, 109 was adopted for questionnaire administration. This is to enable the collection of adequate data for the study. The sample frame for the study is clearly explained in the table below;

Table 2: Sample size of the study

S/N	Professionals	Sample Size
1	Builders	25
2	Quantity surveyors	45
3	Architects	18
4	Civil Engineers	21
	Total	109

2.7 Sample Techniques

There are two types of sampling techniques to determine the sample selection from this research's population. These are probability sampling and non-probability sampling. In probability sampling, all elements in a sampling frame have the same chance or probability of being selected to participate in the survey. The reason for adopting simple random sampling is that it gives an equal chance of selecting all the internally displaced people in the study area.

3. Result Analysis and Discussion

3.1 The factors influencing sustainable construction practices on labour productivity

The factors influencing sustainable construction practices on labour productivity were assessed through a survey, with respon dents ranking various reasons for application. Table 3 presents the mean scores, standard deviations, and ranks of each factor, providing insights into their perceived significance and variability.

Table 3: The factors that influence Sustainable Construction Practices on Labour Productivity

SN	Reasons for application	Mean	Std. Deviation	Ranking
1	Training and Education Programs	4.5000	.76335	1
2	Technological Advancements	4.3806	.83886	2
3	Resource Efficiency	4.3657	.81841	3
4	Collaborative Planning and Design	4.3284	.82056	4
5	Health and Safety Measures	4.3060	.77777	5
6	Supplier and Contractor Engagement	4.2463	.78937	6
7	Incentive Programs	4.2015	1.01700	7
8	Regulatory Compliance	4.1045	.93607	8
9	Stakeholder Engagement and Communication	3.8209	.84827	9
10	Monitoring and Evaluation Systems	3.7015	.79500	10
11	Knowledge Sharing and Best Practices	3.5746	.78880	11
12	Green Building Certifications	3.1418	.73733	12
13	Waste Management Strategies	3.1343	.95611	13
14	Community Engagement and Social Responsibility	2.8209	.68112	14

This analysis offers valuable information for stakeholders seeking to enhance labour productivity through sustainable construction initiatives. In this presentation and analysis, each factor while referencing relevant literature to provide the support and justification from the previous authors in the literature.

Moreover, "Training and Education Programs" emerged as the most influential factor, receiving the highest mean score of 4.5000 and ranking first. This finding is consistent with prior research emphasizing the importance of education and skill development in promoting sustainable construction practices (Shen et al., 2020; Tam et al., 2020). Training programs equip workers with the knowledge and skills necessary to implement sustainable techniques effectively, thereby enhancing productivity and quality while reducing resource consumption and environmental impact. Investing in continuous education and training initiatives is crucial for fostering a skilled workforce capable of meeting the challenges of sustainable construction.

Additionally, "Technological Advancements" ranked second, with a mean score of 4.3806, highlighting the role of technology in driving innovation and efficiency in construction practices. This finding resonates with literature documenting the transformative impact of technology, such as Building Information Modeling (BIM) and automation, on sustainable construction (Olawumi et al., 2020; Wang et al., 2021). Technological advancements enable the optimization of resource use, streamlining of processes, and improvement of communication and collaboration among project stakeholders. Embracing technological solutions can enhance labour productivity and project outcomes while advancing sustainability goals in the construction industry.

"Resource Efficiency" ranked third, with a mean score of 4.3657, underscoring the importance of optimizing resource use to minimize waste and environmental impact. This finding aligns with research emphasizing the benefits of resource-efficient construction practices, such as lean construction and green building techniques (Llatas et al., 2019; Seyedhoseini et al., 2021). Resource-efficient design and construction methods prioritize the conservation of materials, energy, and water, leading to cost savings and environmental benefits. Integrating resource efficiency principles into project planning and execution can enhance labour productivity by reducing waste, improving workflow efficiency, and enhancing project sustainability.

Furthermore "Collaborative Planning and Design" and "Health and Safety Measures" ranked fourth and fifth, respectively, highlighting the importance of collaboration and safety in sustainable construction practices. These findings are consistent with literature emphasizing the role of collaboration and safety culture in project success and worker well-being (Ling et al., 2020; Wang et al., 2020). Collaborative planning and design involve engaging stakeholders early in the project lifecycle to integrate sustainability considerations and optimize project outcomes. Similarly, prioritizing health and safety measures not only protects workers but also enhances productivity by reducing accidents, disruptions, and associated costs.

Therefore, the analysis also reveals other notable factors influencing sustainable construction practices, including supplier and contractor engagement, incentive programs, regulatory compliance, and stakeholder engagement. Each of these factors plays a critical role in promoting sustainability and labour productivity in construction projects, necessitating proactive management and integration into project planning and execution. By addressing these factors holistically and leveraging insights from previous research, stakeholders can enhance labour productivity, optimize project outcomes, and advance sustainability goals in the construction industry.

3.2 Effects of the challenges of sustainable construction practices on labour Productivity in Construction sites in Gombe metropolis Metropolis

Linear regression was also used to determine the Effects of the challenges of sustainable construction practices on labour Productivity in Construction sites in Gombe metropolis Metropolis.

Table 4: Effects of the challenges of sustainable construction practices on labour Productivity in Construction sites

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.111[a]	.012	.005	.62997	1.638	.203[b]

a. Predictors: (Constant), challenges of Sustainable Construction Practices

b. Dependent Variable: Labor Productivity

Table 4 shows the regression model summary and the ANOVA results of the dependent and independent variables. The model reported R-Value of 0.111 and R-Square value of 0.012 with an F-statistics value of 1.638 were insignificant, as shown by ρ-value of 0.203, far above the recommended maximum of 0.05 (Pallant, 2011). However, about 01.2% of labour productivity is influenced by the Sustainable Construction Practices. Moreover, the result also indicated that Sustainable Construction Practices have negligible effect on labour productivity. This result disagrees with that of Ghoddousi, Poorafshar, Chileshe and Hosseini (2015), that construction labour productivity significantly influences the Sustainable Construction Practices; however, In summary, labor productivity significantly influences sustainable construction practices by enabling efficient resource utilization, facilitating the adoption of sustainable techniques, supporting the implementation of green building standards, promoting workforce training in sustainability principles, and contributing to cost savings associated with sustainable construction.

4. Summary of Findings

The findings of this study shed light on critical factors influencing labour productivity, paving the way for the development of strategies to mitigate inefficiencies and enhance the management of construction labour forces. Understanding these factors is paramount for improving project performance, enhancing competitiveness within the construction sector, and ensuring the sustainability and longevity of construction companies in a highly competitive environment Ineffective communication by non-

active listening and unclear feedback, lack of management by objectives by non-joint participation in setting goals, lack of positive feedback, "correct in public and praise in private", lack of quality circles by the non-forming team, lack of Brainstorming of a group-specific technique designed to generate a range of ideas, non-extension of job and lack of job enrichment. In contrast, the least challenges of application of non-financial motivation in project construction site were non-clarity of assigned tasks and non-delegation on a time-bound execution/supervision of the project.

The study findings identified major reasons for the application of non-financial motivation in the study area were increasing workers' productivity, achieving the set targets, increasing workers' performance, increasing productive work time, reducing the cost of production, promoting greater output, increasing development of labour capability and increasing quality of output. In contrast, the least reason for application of non-financial motivation in the study area was actualisation of workers self-esteem, increasing job enlargement and increasing job enrichment.

5. Conclusion and Recommendations

5.1 Conclusion

The study observed significant challenges of application of non-financial motivation in project construction sites were an In-equitable reward plan in line with effort and contribution, Imbalance between financial and non-financial rewards, Ineffective communication by non-active listening and unclear feedback, lack of management by objectives by non-joint participation in setting goals, lack of positive feedback, "correct in public and praise in private", lack of quality circles by the non-forming team, lack of Brainstorming of a group-specific technique designed to generate a range of ideas, non-extension of job and lack of job enrichment. In contrast, the least challenges of Sustainable Construction Practices on Labour Productivity in Construction sites were non-clarity of assigned task and non-delegation on a time-bound execution/supervision of the project.

5.2 Recommendations

- The study recommends that the project managers understand critical factors affecting workers' motivation that can help develop strategies to reduce inefficiencies and manage construction labour forces more effectively. This will improve construction companies' project performance, make them more competitive, and consequently increase the chances of survival within this highly competitive sector.
- The study also recommends that project managers should establish an application of motivation units in their respective organizations. This can increase workers' productivity, job enrichment, and job enlargement.
- It is commended that the project managers should be focused on the relative levels of impact of identified challenges such as non-delegation and execution/supervision of the project so that the project team could be guided well in their efforts to address the challenges cost-effectively.

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