

STUDY OF INTERNAL FACTORS AFFECTING LABOUR PRODUCTIVITY IN MEDIUM SIZED CONSTRUCTION FIRMS IN NIGERIA

by

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ABSTRACT

Productivity is crucial to the competitiveness, achievement of set goals, and meeting stakeholders value propositions by construction firms. This paper presents an assessment of the factors impacting on the productivity of building trade workers in medium size construction firms, which in turn is to be the premise for improving labour output in the building sector. The assessment was conducted through the administration of 267 questionnaires for information on three trades. These were analysed under seven categories of 41 factors considered by the computation of their Mean Ratings (MR) in order to establish the impact factor of each Factor. The impact factors in the various categories were identified to be between 3.33 and 3.97. On the premise of the results of this study construction firms should conduct productivity study at the activity/operation level in order to have a basis for implementing motivational incentives in the form of best employees of the year in order to encourage output of workers.

1. INTRODUCTION

The construction Industry in any part of the world produces and maintains infrastructures and buildings that support various social, economic and industrial functions. Thus, this scenario makes the industry a major factor in the drive for economic progress of a nation (Achuenu, et al, 2000). In Nigeria, the industry when viewed from the perspective of its dynamism has the capacity to generate employment and absorb both skilled and unskilled operatives for the various trades in the sector (Anago, 2001). Over the years, the industry has made significant contribution to the economic development of the country.

The preceding scenario indicates that the construction industry requires and utilises huge amount of material and human resources. Thus, its efficiency and effectiveness depends on among other factors on the quality and availability of its workforce. This also indicates its contribution to National Development can be seriously inhibited by shortage and poor quality of a skilled workforce.

Works of Izam and Adeagbo (1999) and Lawal and Kolawole (2004), have given insights on the problem of low productivity in the Nigeria construction industry. This makes it imperative to establish ways of increasing productivity in the industry, an effort that can lead to reduction in project cost overrun and project completion delays. Cost and time overruns are two common problems of construction sectors in developing countries (Ofori, 2000).

Knowledge and understanding of the different internal factors affecting labour productivity in the construction industry is necessary in determining the necessary steps for reducing project cost overrun and completion delay, thereby increasing productivity and project performance. This paper reports the findings of a study that appraised those internal factors affecting labour productivity in medium sized construction firms in Nigeria through a survey and observations on project site.

2. THEORETICAL FRAMEWORK

2.1 Internal Factors Affecting Labour Productivity in the Construction Industry

The factors influencing construction productivity have been the subject of inquiry by many researchers. In order to improve productivity, an evaluation of the positive or negative impact of such factors is necessary. In the words of Adnan et al. (2007), making use of those factors that positively affect productivity and eliminating (or controlling) factors that have a negative effect will ultimately improve productivity. Presumably, it is possible to forecast productivity on the premise of those factors influencing productivity. It is worth acknowledging the submission by Adnan et al. (2007), that several researchers have investigated the factors affecting labour productivity. However, factors with significant influence on productivity as propounded by different researchers are seldom same across national boundaries. There seem to be no agreement on the classification of these factors (Adnan et al, 2007).

There are several investigations on Labour productivity in construction and the factors that impact on them. However, the research report being presented in this paper was premised on aspects of the work by Durdyev and Mbachu (2011). They identified 56 variables that affects construction productivity, and categorized them into 8 factors of internal and external. The internal constraints with five groups of factors: Project characteristics, project finance, workforce, project management and Technology/process. While the external constraint with three groups of factor are unforeseen events, statutory compliance and other external forces.

The factors identified in Durdyev and Mbachu (2011), were the basis for preparing a questionnaire for obtaining data that addresses the question of what influence the performance of labour output in the medium size construction firms in Nigeria. The study was limited to three construction trades in three states within the study area.

3. RESEARCH METHODS

3.1 Data Collection

The study adopt the used of activity sample study measurement and questionnaire as a means for collecting data. The questionnaire had mainly closed ended questions divided into three sections. The first section had 10 questions for general information about respondent. Second section is for questions on factors that negatively affect labour productivity. While the third section comprised questions on activity sample study. This section was further sub-divided into two parts to cover

activities during productive man-hours and unproductive factors. Unnecessary personal data, complex and duplicated questions were avoided. In each questionnaire, an explanatory letter was attached to explain the way of responding, the aim of the study and the security of the information.

3.2 Data Analysis

The research adopted the multi-attribute analytical technique in analyzing the data collected from the field. This approach was considered appropriate because it enabled group ranking of variables in a given set. Thus, mean rating was computed using the following equation:

$$MR_j = \sum (Rp_{jk} \times \%R_{jk})$$

Where:

MR_j = Mean ranking for internal factor j;

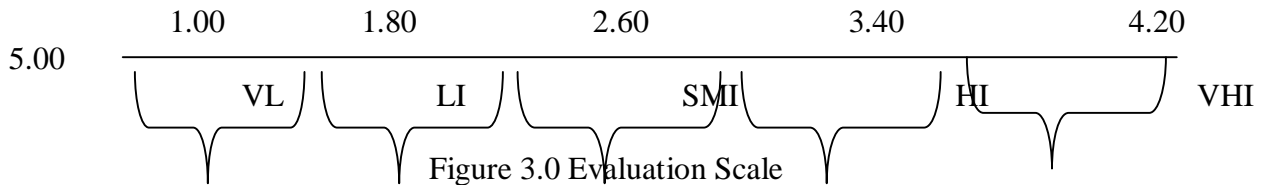
Rp_{jk} = Ranking point K (Ranking from 5-1);

%R_{jk} = Percentage response to ranking point K for internal factor j.

K= 1 to 5.(5 point likert scale i.e 1= strongly disagreed to 5= strongly agreed)

3.2 1 Level of Impact of the internal factors

The ordinal scale was used to determine the level of impact based on the mean rating (MR) computation. The scale was divided into five categories; from 1- 1.8 = very low impact, 1.8- 2.6 = low impact, 2.6- 3.40 = small impact, 3.40- 4.20 = high impact and 4.20- 5.00 = very high impact. Factors that have mean ratings (MR) within this range were categorised as having a value within the range very low impact to very high impact as shown below.



3.3 Survey Response

A total of 267 questionnaires were retrieved from a total of 351 that were administered. This gave a response rate of 76.07% (Table 3.0).

Table 3.0 Statistical Data of survey area and percentages of responses.

study area	questionnaire distributed				Response rate (%)	
	Carpenters	Masons	Steel fixers	Sub Total	Carpenters	Masons
Kaduna	51	51	51	153	39 45.9%	41 45.1%
Kano	51	51	51	153	35 41.2%	40 44.0%
Sokoto	15	15	15	45	11 12.9%	10 11.0%
total	117	117	117	351	85	91

Source: Field Survey 2013.

4. RESULTS AND DISCUSSIONS

4.1 Characteristics (Sex, Age and Qualification) of Respondents

Majority of the respondents (98.13%) across, carpentry, masonry and steel fixing, were males with less than 2% being female (see table 4.1). It is worth noting that within the survey area, there are traditional and religious beliefs that restrict some female from going out to take part in such activities. This has been found to be the general trend in the construction industry in Nigeria (Kolawale and Boiso, 1998). Furthermore, construction works are perceived by many (including the females themselves) as being a man's activities.

4.2 Mean Rating and Correlation Analyses of Grouped Factors

4.2.1 Project Finance Factors

The mean ratings and ranking of factors as shown in Table 4.2 indicates that low payment is the most significant factor in the project finance group. Also a financial difficulty from owners is rated second while dispute and litigation costs rated third in this group. On the other hand, under-value work/poor work and late payments are lowest factors negatively affecting labour productivity in this group. Testing correlation for agreement on level of impact of project finance factor among Carpenters, Masons and steel fixers revealed that there is very high correlation between Carpenters and Masons ($\rho = 0.83$). Also there is weak correlation between Carpenters and steel fixers ($\rho = 0.49$) and there is high correlation between Masons and steel fixers ($\rho = 0.77$).

4.2.2 Work Force Factors

Ranking of Workforce factors shown in table 4.3, suggest that low level of motivation and commitment are factors that should be consider first amongst factors that can negatively affect labour. However, less familiarity with current job and condition of such work was rated second and misunderstanding among labourers rated third. The level of staff turnover was rated ninth (9th) having a mean rating (MR=2.78). Testing correlation for agreement on important factor of workforce between Carpenters, Masons and Steel Fixers revealed that there is very high correlation between Carpenters and Masons ($\rho = 0.98$). Also there is very high correlation between Carpenters and steel fixers ($\rho = 0.91$) and there is very high correlation between Masons and steel fixers ($\rho = 0.93$).

4.2.3 Technology/Process Factors

Analysis of the sub-factors under the technology/process related broad category of internal factors on labour productivity in medium size construction firms is presented in Table 4.4. The majority of the respondents rated the inadequacy of method of construction as having the greatest impact on internal labour productivity. This relates with the studies of Alinaitwe *et.al* (2007); Sanders and Thomas, (1993) that said method adopted in the construction process has far reaching implications on productivity and performance of the construction crew. However, the method depends on the design and what the owner or the resident engineer is willing to approve as the appropriate method in the circumstances. Testing correlation for agreement on mean rating (MR) of technology/process among Carpenters, Masons and Steel fixers indicated that there is high correlation between Carpenters and Masons ($\rho = 0.94$).

4.2.4 Project Characteristics Factors

On project characteristics issues (see Table 4.5) sub-standard working condition is the most rated factor among others. Project complexity; scale, access, sub-soil and topography ranked second while site location and environment ranked third. The least rated factor in this group is type of procurement adopted. Testing correlation for agreement on mean rating with respect to project characteristic factors between the trades considered, revealed that there is non-linear correlation or very weak between Carpenters and Masons and between Masons and Steel Fixers. Both categories have $\rho=0.00$.

4.2.5 Project Management Factors

Table 4.6 shows that project management style and harmony among professionals set of constraints was found to be the most influential internal factor negatively affecting labour productivity having MR of 3.97. Frequent changes in design and scope of work ranked second with (MR=3.89), while coordination, supervision, performance monitoring and control ranked third with (MR=3.79). This result is in agreement with the study of Thomas and Sakarcan, (1994) who found that supervision and proper coordination of sub-contractors have the most significant impact on internal labour productivity at construction sites. Testing correlation for agreement on mean rating of project management/team factors between Carpenters, Masons and Steel Fixers indicated that there is high correlation between Carpenters and Masons ($\rho=0.88$).

4.2.6 Materials and Tools Factors

Improper tools and materials for work, materials shortages and poor condition of equipment and tools have important influence on labour productivity (see table 4.7). Indeed improper tools for work are the most important factor in this group. Also shortage of material and tool has impact on labour productivity (MR=3.77). On the other hand, unsuitability of materials storage location has less impact than any other factor listed. Testing correlation for agreement on mean rating of materials and tools factor between Carpenters, Masons and Steel fixers revealed that there is partial correlation between Carpenters and Masons ($\rho=0.60$).

4.2.7 Safety Factors

As outlined in table 4.8, working at higher places (platforms) have large impact on labour productivity. On the other hand non engagement of safety officers in construction site ranked second. While non-implementation of safety precaution, noise and bad ventilation ranked the least among safety factor on productivity. Testing correlation for agreement on mean rating of safety factor between Carpenters, Masons and steel fixers revealed that there is strong correlation between Carpenters and Masons ($\rho= 0.83$). Also there is partial correlation between Carpenters and Steel Fixers ($\rho=0.60$) and Masons and Steel Fixers ($\rho=0.60$).

4.3 Ranking of factors impacting on labour productivity

Findings from this study indicate that there are five factors having the most negative effect on labour productivity. These are project management style and harmony, inadequate method of construction, low level of motivation and commitment, level of familiarity with current job and condition, and frequent changes in design and scope of work. Also results indicate that the factors with low impact on labour productivity are late payments, low level of staff turnover, health of workforce, unsuitability of material storage location, and poor condition of equipments and tools. Furthermore, results indicate that poor coordination, supervision, performance and monitoring, improper tools for work, material shortages, misunderstanding within labourers and sub-standard

working condition have high impact on labour productivity and should be avoided to improve labour productivity on site. Also, the result show that inadequate site layout, and financial difficulties from owners have the same rank ($R=20$) which indicate that there mean rate is ($MR=3.55$) with high impact on productivity. While labour disloyalty and bad ventilation have ($MR=3.23$) with small impact to productivity on site. Testing correlation for agreement on ranking factors negatively affecting labour productivity between Carpenters, Masons and Steel Fixers revealed that there is very strong correlation between Carpenters and Masons ($\rho=0.99$).

4.4 Ranking of groups of factors impacting on labour productivity

Survey results indicate that project management/team factors group ranked most important among all groups of productivity factors. On the other hand, material and tools, and safety factors ranked least important among all factors groups. Project characteristics factor group ranked second with ($MR= 3.59$), technology/process factors ranked third with ($MR=3.51$). While workforce factor ranked fourth with ($MR=3.41$), also the result indicated that both project management/team factors, project characteristics, technology/process and workforce factors have high impact on labour productivity on site and they should be given much consideration during planning stage.

5. Conclusion

The assessment of internal factors affecting labour productivity in the medium size construction firms were prioritised based on their level of impact. A total of forty one (41) sub-factors assessed were categories into seven groups; project finance group, project characteristics group, workforce group, technology/process group, project management/team group, material/tools group and safety group.

The impact factor in the various categories were identified to be between 3.33 and 3.97.; they are low payment with ($MR=3.77$), motivation/commitment with ($MR=3.91$), inadequate method of construction with ($MR=3.96$), sub-standard working condition with ($MR=3.70$), project management style/harmony with ($MR=3.97$), improper tools for work with ($MR=3.78$) and working at higher places with ($MR=3.72$). The results also showed that project management style/harmony have higher impact among the overall factors with mean rating ($MR=3.97$); while project management group was ranked 1st with ($MR=3.66$) among other groups followed by project characteristics ($MR=3.59$), technology/process group ($MR=3.51$), work force group ($MR=3.41$), project finance group ($MR=3.38$), and material/tools, safety groups ($MR=3.33$).

It became obvious that within the forty one (41) sub-factors twenty five (25) factors have high impact on labour output, while sixteen (16) factors have small impact. Furthermore, the Spearman's co-efficient of correlation was found to be 0.99 for Carpenters and Masons, 0.99 for Masons and Iron-bender. These show that there is strong agreement among the respondents on those factors affecting labour productivity in construction industry.

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APPENDIX A

Table 4.1 Gender of Respondents

Gender	Carpenter	Mason	Iron-bender	All
Male	85	86	91	267
Female	0	5	0	5
Total	85	91	91	267

Table 4.2 Ranking Project Finance Factors

Group 1 (G1) Project Finance Factor	Mean Rating	Level of Impact	Ranking	Spearman's coeff.corr. Of rank
Repeated work	3.57	High	2	
Low payment	3.77	High	1	
Financial difficulties from the owner	3.55	High	3	
Late payment	2.65	Small	6	
Dispute and Litigation cost	3.41	High	4	
Under valued work/poor work	3.4	Small	5	
Correlation Coefficient of Rank				0.84 Strong
				0.49 Weak
				0.77 Strong

Table 4.3 Ranking Workforce factors

Group 2 (G2) Workforce Factors	Mean Rating	Level of Impact	Ranking	Spearman's coeff.corr. Of rank
Misunderstanding among workers	3.72	High	3	
Level of Skill and Experience of workforce	3.61	High	5	
Level of Motivation/Commitment	3.91	High	1	
Absenteeism of Gang	3.64	High	4	
Labour Disloyalty	3.23	Small	6	
Health of the workforce	2.82	Small	8	
Level of Familiarity with current job/condition	3.9	High	2	
Level of Staff turn over	2.78	Small	9	
Use of Alcohol and drug by workforce	3.07	Small	7	
Correlation Coefficient of Rank				0.98 Strong
				0.91 Strong
				0.93 Strong

Table 4.4 Ranking Technology/Process factors

Group3(G3)Technology/Process Factor	Mean Rating	Level of Impact	Ranking	Spearman's coeff.corr. Of rank	
Inadequate method of construction	3.96	High	1		
Inadequate of plant and equipment employed	3.33	Small	5		
Inadequate IT infrastructure and application	3.63	High	2		
Inadequate Site layout	3.55	High	3		
Resistance to accept new technologies	3.1	Small	6		
Lack of awareness of or training on new technologies	3.48	High	4		
				0.94	Strong
Correlation Coefficient of Rank				0.94	Strong
				0.83	Strong

Table 4.5 Ranking Project Characteristics factors

Group 4(G4) Project Characteristics factors	Mean Rating	Level of Impact	Ranking	Spearman's coeff.corr. Of rank	
Type of procurement adopted	3.36	Small	4		
Site location and environment	3.66	High	3		
Project complexity; access, subsoil, topography, and design	3.67	High	2		
Sub-standard working condition	3.7	High	1		
				0	Non-lin
Correlation Coefficient of Rank				0	Non-lin
				0	Non-lin

Table 4.6 Ranking Project Management factors

Group 5(G5) Project Management factors	Mean Rating	Level of Impact	Ranking	Spearman's coeff.corr. Of rank	
Lack of coordination, supervision,	3.79	High	3		
Clients overt influence on the construction process	3.15	Small	6		
Inadequate of Planning and risk management process	3.59	High	5		
Poor project organizational culture	3.6	High	4		
Project management stlye/harmony	3.97	High	1		
Frequent changes in design and scope of work	3.89	High	2		
				0.88	Strong
Correlation Coefficient of Rank				0.88	Strong
				0.83	Strong

Table 4.7 Ranking Materials and Tools factors

Group 6(G6) Materials and Tools factors	Mean Rating	Level of Impact	Ranking	Spearman's coeff.corr. Of rank
Improper tools for work	3.78	High	1	
Frequent material shortages	3.77	High	2	
Unsuitability of materials storage location	2.87	Small	4	
Poor condition of equipment/Tools	2.9	Small	3	
				0.6 Partially
Correlation Coefficient of Rank				0.8 Strong
				0.8 Strong

Table 4.8 Ranking Safety factors

Group 7(G7) Safety factors	Mean Rating	Level of Impact	Ranking	Spearman's coeff.corr. Of rank
Unemployment of safety officer in	3.56	High	2	
Bad Ventilation	3.23	Small	4	
Insufficient lighting	3.25	Small	3	
Noise	3.05	Small	6	
Non-implementation of safety precautions	3.17	Small	5	
Working at high places	3.72	High	1	
				0.83 Strong
Correlation Coefficient of Rank				0.6 Partial
				0.6 Partial

Source: Field Survey 2013