An Identification of Clogs Impeding Craftsmen's Productivity in the Construction Industry in South-Western Nigeria

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Abstract - **Construction firms in Nigeria are known at making frantic efforts to compete favourably for contracts, make profits and also strive to remain in business. For this to manifest however, productivity among others must be sustained. This paper therefore addresses the clogs that can affect craftsmen's productivity in southwestern Nigeria. With a focus on the two states (Lagos and Oyo) in the study area, one hundred questionnaires each, backed with on-site observation, were administered to the management and craftsmen on construction sites in the three stratifications (large, medium and small firms). Parametric and non-parametric statistical techniques' results indicate that the five most ranked factors affecting craftsmen's productivity are inadequate/lack of tools and equipment, rework, material shortage, inclement weather and fatigue. The paper concluded that all the identified factors must be addressed by the stakeholders in the construction industry in order to improve craftsmen's productivity in Nigeria.**

Keywords: Construction Industry; Clogs; Craftsmen; Identification; Productivity; Southwestern Nigeria.

I. INTRODUCTION

The construction industry is considered to be very essential to the economy of every nation. This importance stems from a wide range of reasons associated with certain peculiar features of the industry such as its products being investment-goods [1]. It covers half of the whole field of fixed capital accumulation [2], therefore, it constitutes the most single sector of capital formulation in any national economy [1]. Adedeji (cited in Fagbenle, et al. [3]) observed that building industry being a subset of the construction industry is one of the most important sectors of the Nigerian economy. Productivity is considered as one of the most important factors affecting the success and overall performance of every organization, whether large or small, in today's competitive market [4].

Past studies [5], [6], [7], [8] are however related to calculating the effect of productivity factors. They also looked at the construction industry as a whole, yet the majority of the workers are employed on building sites. Various factors have been identified by different researchers from the time aspect in different construction sites. Lack of materials, incomplete drawings, incompetent supervisors, lack of tools and equipment, absenteeism, poor communication, instruction time, poor site layout, inspection delay and rework were found to be the ten most significant problems affecting construction

productivity in Nigeria [3]. Corroborating this, Olomolaiye et al. (cited in Fagbenle et al., [1]) asserted that the five most significant factors in Nigeria are lack of materials, rework, inadequate equipment, supervision delays, absenteeism, and interference. Kaming et al. [9] discovered that lack of materials, rework, worker interference, absenteeism, and lack of equipment were the most significant problems affecting workers in Indonesia. Lack of materials, weather and physical site conditions, lack of proper tools and equipment, design, drawing and change orders, inspection delays, absenteeism, safety, improper plan of work, repeating work, changing crew size and labour turnover were found out to be the most critical factors in Iran [10].

Lim and Alum (2005; cited in Iyer and Jha [11]) found that the major problems with labour productivity in Singapore are recruitment of supervisors, recruitment of workers, high rate of labour turnover, absenteeism at the workplace, communication with foreign workers, and inclement weather. Lema (cited in Navon [7]), through a survey of contractors in Tanzania revealed that the major factors that influence productivity are leadership, level of skill, wages, level of mechanization, and monetary incentives. Abdulaziz, Jarkas, and Bitar (cited in Fagbenle et al. [1]) carried out a survey in Kuwait and their findings indicated that clarity of technical specifications, extent of variation/change orders during execution and coordination level among various design disciplines were the main factors impeding labour's productivity. In view of this, Maloney (1983; cited in Olomolaiye and Ogunlana, [12]) remarked that craft workers as the major player executing construction processes and activities have a significant influence on construction labour productivity. In the same vein, Dai et al. (cited in Fagbenle et al. [3]) considered craft workers to be in the ideal position to know where and how much of site's productivity is lost or could be gained. Since labour productivity involved the management of labour, project supervisors/engineers often regarded as middle level managers are responsible for the coordination of the instructions from upper level managers for implementation by the craftsmen. These instructions equally affect construction labour productivity. In today's era, one of the biggest concerns for any organization is to improve their productivity, representing the effective and efficient conversion of resources into marketable products and determining business profitability [4]. Consequently, considerable effort has been directed to understand skilled labour productivity concept with different approaches taken by researchers, resulting in a wide variety of productivity definitions (Lema and Samson, 2002; Oglesby et al., 2002; Pilcher, 1997). This research therefore focused attention on the various factors perceived to be impeding skilled labour productivity in building construction projects in Southwest Nigeria.

II. RESEARCH METHODOLOGY

Data were put together through questionnaire survey. Samples were randomly elicited from construction craftsmen and management in the two selected states of southwestern Nigeria (Lagos and Oyo). The decision was based on the volume of construction activities that are taking place in the two states compared to other states in the southwestern Nigeria, except Ogun which is considered too close to Lagos State. Two sets of questionnaires were prepared on likert type scale of one to four to sample the opinion of two of the main construction stakeholders (craftsmen and management) in identifying the clogs perceived to be hindering construction productivity and to also determine the premium placed on them. The craftsmen surveyed were bricklayers and carpenters because a vast majority of the construction materials used on sites are blocks/bricks and timber (wood). Research assistants were employed to distribute questionnaires and assist some of the respondents on site to interpret the questionnaires. The project types considered were building construction while the sites were stratified into three major types (large-sized, medium-sized and small-sized firms). The stratification was based on the geographical spread and annual turnover [1]. Sample size was calculated from the following formula [3]:

$n = n^1/ [1 + (n^1/N)]$

Where,

n = sample size

$n^1 = S^2/V^2$

N = total estimated population

V = standard error of the sampling distribution = 0.5

S = maximum standard deviation in population.

Total error =0.1 at a confidence level of 95% and

$S^2 = (P) \times (1-P) = (0.5) \times (0.5) = 0.25$

where P is the proportion of population elements that belong to a defined class.

Therefore, 100 questionnaires were administered on each of the identified target respondents, of which 75 and 72 questionnaires were filled and returned by craftsmen and management respectively. From the 75 questionnaires returned by the construction craftsmen, 20, 25 and 30 questionnaires were respectively from large-sized, medium-sized and small-sized firms. For the management, 21, 23 and 28 questionnaires were from large-sized, medium-sized and

small-sized firms respectively. This was to allow for the homogeneity of study and for comparison of findings.

The relative index (RI) attached to each of the identified clogs was calculated using the following formula (Fagbenle, 2000; cited in Fagbenle, et al., 2011):

$$\text{Relative Index} = \frac{\text{Point Total}}{4 \times \text{Sample Size}}$$

Several factors perceived to be impeding craftsmen's productivity have been identified in the literature and out of which sixteen (16) most critical clogs relevant to this study were elicited for the respondents' ranking. They are: materials shortage; incomplete drawings; poor supervision; inadequate tools and equipment; workers' absenteeism; poor communication; instruction time; poor site layout; inspection delay; rework; interference; inclement weather condition; high rate of labour turnover; level of skills of workers; sophistication of mechanization; and monetary incentives. The next section therefore presents the findings of the study.

III. RESULTS AND DISCUSSIONS

Results in Table 1 showed that craftsmen in the three categorizations of construction firms surveyed were of the strong convergent of opinions that the five most influencing clogs impeding their productivity on sites are: inadequate/lack of tools and equipment (RI = 0.78); rework (RI = 0.74); materials shortage (RI = 0.70); inclement weather (RI = 0.67); fatigue/interference (RI = 0.61). Inadequate/lack of tools and equipment has been identified as the bane of construction productivity on sites. Use of obsolete tools and equipment will no doubt impede the speed of a craftsman regardless of his wealth of experience and complaints will always be the order of the day in this regard. On the other hand, a well-motivated craftsman with state-of-the-art tools and equipment is not unlikely to radiate with confidence in his daily activities which in turn increases his productivity. No wonder that this factor was accorded the highest premium by the craftsmen. This supports the views of Fagbenle et al. (2011) and Olomolaiye et al. [13] that use of adequate tools and equipment is a great asset for construction productivity. Also, continuous rework of a particular construction activity over a long period of time seems to discourage such craftsmen on sites which in turn impede productivity. Material shortage on it will no doubt leave workers idle on site and productivity for that period of time will be near zero. This is in tandem with Kaming et al. [9]'s findings on Indonesian construction sites. Also, inclement weather such as high temperature (extremely hot sun), heavy downpour and harsh weather can go a long way in reducing the performance of an average craftsman on site. The study corroborates the findings of Lim and Alum (2005) that harsh weather remains one of the greatest challenges affecting productivity on construction sites in Singapore. Fatigue and interference were accorded the same weight by the respondent craftsmen. It is obvious that an already worn-out craftsman can hardly perform any magic in terms of productivity on construction sites.

Also, issuing out instructions upon counter instructions to the craftsmen by the superior officers on construction sites might be counter-productive and little wonder that this factor was also rated high (fifth) by the respondent craftsmen on sites. Other rankings by the craftsmen indicated the following: poor supervision (RI = 0.56); monetary incentives (RI = 0.56); inspection delay (RI = 0.49); incomplete drawings (RI = 0.47); sophistication of mechanization (RI = 0.46); poor communication/instruction time (RI = 0.44); level of craftsmen's skills (RI = 0.43); workers' absenteeism (RI = 0.41) high rate of labour turnover (RI = 0.37) and poor site layout (RI = 0.31).

Table 1: Relative Index of Clogs Impeding Craftsmen's Productivity on Construction Sites in Southwestern Nigeria (Craftsmen's Responses)

S/N	Factors (Clogs)	Large Firms	Medium Firms	Small Firms	All Firms	Rank
1.	Material Shortage	0.63	0.79	0.67	0.70	3rd
2.	Incomplete Drawings	0.48	0.50	0.44	0.47	10th
3.	Poor Supervision	0.48	0.68	0.53	0.56	7th
4.	Inadequate/Lack of Tools and Equipment	0.75	0.84	0.75	0.78	1st
5.	Workers' Absenteeism	0.31	0.58	0.33	0.41	14th
6.	Poor Communication/Instruction Time	0.39	0.55	0.39	0.44	12th
7.	Fatigue	0.55	0.71	0.58	0.61	5th
8.	Poor Site Layout	0.25	0.39	0.30	0.31	16th
9.	Inspection Delay	0.40	0.61	0.47	0.49	9th
10.	Rework	0.69	0.81	0.72	0.74	2nd
11.	Interference	0.51	0.72	0.59	0.61	5th
12.	Inclement Weather	0.61	0.78	0.63	0.67	4th
13.	High Rate of Labour Turnover	0.26	0.52	0.33	0.37	15th
14.	Level of Craftsmen's Skills	0.50	0.40	0.40	0.43	13th
15.	Sophistication of Mechanization	0.31	0.44	0.62	0.46	11th
16.	Monetary Incentives	0.44	0.64	0.60	0.56	7th

Management's views (Table 2) on the first five clogs impeding construction productivity on sites were a bit similar to the craftsmen's ranking in this regard except Clog Serial Numbers 10 and 1 that were interchanged. For instance, the five most ranked clogs by the management in the three categories of construction firms used for the study were: inadequate/lack of tools and equipment (RI = 0.78); materials shortage (RI = 0.74); rework (RI = 0.72); inclement weather (RI = 0.70); and fatigue (RI = 0.68).

Table 2: Relative Index of Clogs Impeding Craftsmen's Productivity on Construction Sites in Southwestern Nigeria (Management's Responses)

S/N	Factors (Clogs)	Large Firms	Medium Firms	Small Firms	All Firms	Rank
1.	Material Shortage	0.71	0.73	0.77	0.74	2nd
2.	Incomplete Drawings	0.46	0.47	0.47	0.47	15th
3.	Poor Supervision	0.62	0.65	0.65	0.64	7th
4.	Inadequate/Lack of Tools and Equipment	0.73	0.79	0.82	0.78	1st
5.	Workers' Absenteeism	0.49	0.49	0.50	0.49	14th
6.	Poor Communication/Instruction Time	0.55	0.56	0.56	0.56	11th
7.	Fatigue	0.66	0.69	0.70	0.68	5th
8.	Poor Site Layout	0.43	0.45	0.44	0.44	16th
9.	Inspection Delay	0.60	0.63	0.64	0.62	8th
10.	Rework	0.70	0.72	0.75	0.72	3rd
11.	Interference	0.64	0.67	0.68	0.66	6th
12.	Inclement Weather	0.68	0.70	0.73	0.70	4th
13.	High Rate of Labour Turnover	0.58	0.61	0.62	0.60	9th
14.	Level of Craftsmen's Skills	0.50	0.51	0.51	0.51	13th
15.	Sophistication of Mechanization	0.53	0.53	0.54	0.53	12th
16.	Monetary Incentives	0.56	0.58	0.59	0.58	10th

Others, which are almost different in ranking by the craftsmen, include the following: interference (RI = 0.66); poor supervision (RI = 0.64); inspection delay (RI = 0.62); high rate of labour turnover (RI = 0.60); monetary incentives (RI = RI = 0.58); poor communication/instruction time (RI = 0.56); sophistication of mechanization (RI = 0.53); level of craftsmen's skills (RI = 0.51); workers' absenteeism (RI = 0.49); incomplete drawings (RI = 0.47); and poor site layout (RI = 0.44). There was a consensus of opinions among the three site categorizations and the two categories of respondents on the least rank accorded poor site layout. Investigations revealed that this challenge was hardly being encountered on construction sites by them, hence, the lowest premium attached to it.

IV. CONCLUSION

The clogs impeding craftsmen's productivity have been identified and the premiums accorded each of them by the two categories of respondents (craftsmen and management) surveyed have also been highlighted. In an attempt to have an improved productivity from the two types of craftsmen (bricklayers and carpenters) studied, the following are advocated: lack/use of obsolete tools and equipment on construction sites in the three sites categorizations should be

discouraged; avoiding persistent rework on construction sites by issuing out right instructions to the operatives (craftsmen) from inception and clients sticking to the original site drawings. Also, a vibrant material supply unit and automation of the material unit will help in reducing the material challenge on sites. Provision of protective devices is sure pathway for reducing the effects of inclement weather on craftsmen in the three categories of construction sites. Craftsmen should also be allowed to make effective use of their 1-hour rest (break) period each day in order to recuperate well and regain lost energy. Moreover, undue interference by superior officers and issuing of persistent instructions upon counter instructions to craftsmen on sites should be discouraged if productivity is to increase.

This paper has restricted its study to clogs impeding productivity of bricklayers and carpenters in southwest Nigeria. It will however be worthwhile for further studies to be conducted on other regions of the country and Africa as a continent for comparison's sake. Also, the application should be tested on other categories of craftsmen in the construction industry for a wider acceptability.

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