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DETERMINATION OF FACTORS THAT INFLUENCE LABOUR OUTPUT ON CONSTRUCTION SITES IN GHANA

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Labour output affects construction performance in most developing countries. This study aimed at determining the factors that influence labour output on construction sites in Ghana. The research design adopted for the study was a descriptive survey. The study focused on site-level operatives in active operation at their various construction sites. A sample size of 220 site-level operatives was considered. A questionnaire was used as data collection instrument. The study revealed that payment delay, inspection delay, rework, poor communication, unavailability of needed tools, lack of labour supervision and shortage of materials are the major factors that affect labour output in construction sites. The study concludes that labour output of construction workers in Ghana is affected by several factors. It is recommended that construction managers regularly inspect and pay attention to the quality of construction materials and tools used in projects to eliminate inspection delay and unavailability of needed tools.

Keywords: construction sites, inspection delay, labour output, payment delay, labour productivity

INTRODUCTION

Construction is the biggest and most challenging sector in the world (Dorosh, 2020). The construction industry was expected to grow by 3.6% by 2020 before the eruption of the COVID-19 crisis, with revenue forecast at USD 15 trillion by 2024 (Global Powers of Construction [GPoC], 2020). In 2020, the estimate of growth in the construction industry fell to 0.5%, but the numbers vary across the regions. Emerging markets were projected to decline by 2% in 2020, before rebounding to 5% in 2021, while mature economies are expected to decline by 1.5% in 2020, followed by a 2% growth in 2021 (GPoC, 2020). Construction projects around the world have undergone significant costs and time overruns with low labor

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production identified as a major reason for project delays and overruns of cost (Herrera, Sánchez, Castañeda & Porras, 2020).

Labour output has become a big problem in the construction industry in most developing countries, hence affecting construction performance (Adamu, Dzasu, Haruna & Balla, 2011). Ghana Statistical Service (2019), reported that the construction sub-sector recorded the least growth rate of -2.1% in the 2nd quarter of 2019 compared to 0.6% in the 1st quarter of 2019. Also, in the year 2020, the construction sub-sector grew by 0.9 percent in the 2nd quarter of 2020, compared to -1.7% in the 1st quarter of 2020 (Ghana Statistical Service, 2020). This means that Real Estate developers, institutions in the industry are in a great challenge of growth within the industry sector, of which the cost of plants, labour, and materials are not exceptional. Labour output is one of the greatest threats in construction projects in Ghana. Many of the building construction work in Ghana still rely heavily on manual labour in their assembly (Bamfo-Agyei, Thwala & Aigbavboa, 2020). Ghana Statistical Service (2018) report revealed that the construction industry employs over 600,000 workers, amounting to about 7% of the working population in Ghana who are required to deliver the constructed facilities to the clients on time, within budget, and meeting the specified standards of quality. Consequently, there is a growing and continuous interest in productivity studies all over the world because of the importance of labour output in the management and control of project costs (Attar, Gupta & Desai, 2012).

Productivity remains an intriguing subject and a dominant issue in the construction sector, promising cost savings and efficient usage of resources (Enshassi et al., 2007). Present construction contracts are not capable to recovery for productivity loss due to field factors (Construction Industry Institute (CII), 2000). With all the project-cost components such as labours, materials, and equipment; labour component is considered the riskiest. Whereas other components (equipment and material) are determined by the market price, and prices are consequently beyond the influence of project management. Labour cost in the construction industry is estimated to be about 33- 50% of the entire project cost (Hanna et al., 2008). Jarkas and Bitar (2012) and Jarkas et al. (2012) pointed out that, labour cost, in most countries, comprises 30-50% of overall project. Because labour is more variable and unpredictable than other project-cost components, it becomes necessary to understand the effects of different factors on labour productivity. An increase in labour productivity can reduce the labour cost in a direct proportion. It can either benefit or reduce a project's profit, making it of vital interest to the construction industry for its success (Hanna et al., 2008).

Identifying the factors that affect the labour output on construction site is important to the performance of the construction industry. There is therefore the need to determine the factors that affect labour output on construction sites, especially in developing countries context (Adamu, Dzasu, Haruna & Balla, 2011).

In response to this, the current study aims at determining the factors that influence labour output on construction sites in Ghana.

LITERATURE REVIEW

Labour is one of the basic requirements in the construction industry. Labour output usually relates manpower in terms of labour cost to the number of outputs produced (Borcherding & Liou, 1986). Labour is a task that requires the exertion of body or mind or both. It is regarded as an important resource in construction because it is the one that combines all the other resources namely materials, plant equipment, and finance to produce the various construction products as expressed by Fagbenle (2011). This then leaves labour as the major resource opened to improvement. The construction sector is a strategic part of every society, it is one of the largest employers and attracts a large amount of investment (both public and private) while being responsible for providing the necessary infrastructure to nations. Construction employs more than 7% of Europe's workforce and is the largest industrial employer in the continent (Proverbs et al., 1999). Building construction, in particular, consumes approximately 70% of construction investment in developing countries (World Bank, 2015). The battle to complete construction projects on time and within budget is ongoing, being fought when faced with low labour output. Aynur et al. (2008) noted that construction labour accounted for the largest percentage of total project costs in developing countries (i.e., as much as 40% of direct capital cost in large construction projects).

Despite the new technology builders have access to, the excess of construction material, the equipment and financing available, contractors were still faced with rising construction costs, longer project timelines, and cost overruns (Jarkas & Bitar, 2012). Much of the leakage had occurred in labour, where weak output had eroded investments made by contractors. The level of labour output in a country and the construction industry in particular may be determined by a number of factors. According to Attar et al. (2012), the identification and evaluation of factors affecting construction labour output have long been critical issues facing project managers with respect to increasing productivity in construction. Understanding the critical factors that both positively and negatively affect productivity has been posited to be necessary for the enhancement of construction labour productivity and project performance (Enshassi et al., 2007; Attar et al., 2012). Reflecting this perspective, Jergeas (2009) reported that there are undue cost overruns, delays and losses of productivity associated with the delivery of major capital construction projects everywhere in the world. Jergeas's study found that researchers and practitioners have identified poor management practices that lead to poor performance, such as scope changes, design errors and omissions, lack of proper planning and scheduling and improper management of tools, equipment, materials and labour, among many other factors. Several insights and recommendations have been

proposed which are yet to be implemented in a manner that will result into tangible productivity and expected project performance (Jergeas, 2009).

Attar et al. (2012) noted ineffective management to be a primary cause of low productivity and identified a lack of alignment among goals, contractual conflicts, difficulties in measuring productivity, weak commitments to continuous improvement and a lack of labour force focus as barriers to improving productivity. Enshassi et al. (2007) observed that, despite having been intensive investigations made into factors affecting labour output, researchers have not agreed on a universal set of factors with significant influence on productivity nor has any agreement been reached on the classification of these factors. Those authors, however, grouped factors affecting construction labour output into 10 categories: manpower, leadership, motivation, time, materials/tools, supervision, project, safety, quality and external factors. Kazaz et al. (2008) considered labour output factors under four groups – organisational factors, economic factors, physical factors and socio-psychological factors – deriving these four from the theory of motivation.

Adamu et al. (2011) identified 10 labour output-influencing factors among operatives in indigenous construction organisations in the north-eastern states of Nigeria: the absenteeism of gang members, instruction delays, supervisory incompetence, lack of materials, low wage levels, an unfriendly working atmosphere, repetitious work, a lack of proper tools, interference between operatives, changing crew members and inspection delays. The study found that low wages, a lack of materials and an unfriendly working atmosphere most affected labour output. Durdyev and Mbachu (2011) researched key constraints and improvement measures for on-site labour output using 56 sub-factors. The factors were identified under eight broad categories of internal and external constraints: project management/project team characteristics, project finance, workforce, labour-related factors, unforeseen events, technology/process, statutory compliance and other external factors.

Attar et al. (2012) identified factors affecting construction labour output under 15 categories: design factors, execution plan factors, material factors, equipment factors, labour factors, health and safety factors, supervision factors, working time factors, project factors, quality factors, financial factors, leadership and coordination factors, organisation factors, owner/consultant factors and external factors. The study further recognised some of these factors as being among the top ten to affect the labour productivity of small and medium-sized companies, large companies and all companies in general and it was observed that labour-related factors cut across all groups. Although labour-related factors featured prominently among those factors identified as affecting construction labour output, none of these studies considered their influence on construction labour productivity across geographical demarcations by comparing the views of building

craftsmen and site supervisors – important project team members who are directly involved with construction labour productivity matters. Fagbenle (2009) identified three main factors that are affecting site performance as: shortcomings in labour management (unfair wages, lack of motivation etc.); extraneous reasons (harsh weather, breakdown of law and order etc.); and labour's shortcoming (lateness, idleness, poor workmanship etc.). Fagbenle (2009) grouped the factors affecting the environment of construction projects under cultural, economic, political, social, physical, aesthetic, financial, legal, institutional, technological and policy. Other influencing factors identified include traditional measures such as health, safety, material, size and scope (Fagbenle, 2011).

METHODOLOGY

The research design adopted for the study was a descriptive survey. Considering the nature of the study, the descriptive survey design was deemed appropriate in terms of collecting data from a large group of respondents within a relatively short period. The study population includes site-level operatives of some selected construction sites in the Metropolitans and Municipalities of the Central and Western regions of Ghana. These groups of site operatives were considered for the research as they were considered to have a large proportion of their labour force engaged on sites.

Purposive sampling was employed in selecting all the construction site level operators for the study because of the activities required to be studied. The study focused on site-level operatives in active operation during the period of the study. Since it is not economical to consider the entire population due to time and other logistic reasons, a sample size of 220 site level operatives consisting from Cape Coast Metropolis, Mfantesman Municipality, Awutu Senya East Municipality, and Secondi-Takoradi Metropolis. For data collection and analysis, a questionnaire was employed as a data collection instrument.

A questionnaire was used to collect data that was not directly observable from the participants about their characteristics, experiences and opinions. Closed-ended questions were used for the reason that they are easy to ask and quick to answer, they require no writing by either respondent, and their analysis is straightforward. 5-Point Likert scale response was used. Analysis was undertaken to generate a descriptive picture of the data gathered through a questionnaire. In this study, Statistical Package for Social Sciences (SPSS) version 23.0 was used in analysing the data. The contribution of each of the variables was examined and the ranking of the attributes in terms of their criticality as perceived by the respondents was done by the use of Relative Importance Index (RII) which was computed using equation (1):

$$RII = \frac{\Sigma W}{A * N} (0 \leq RII \leq 1) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

W – is the weight given to each factor by the respondents and ranges from 1 to 5, (where "1" is "strongly disagree" and "5" is "strongly agree");

A – is the highest weight (5 in this case) and;

N – is the total number of respondents.

RESULTS AND DISCUSSION

Factors that affects labour output in construction sites

Table 1: Responses on factors that affect labour output in construction sites

Factors affecting labour output	Responses (Ranking)					ΣW	Mean (ΣW/N)	RII	RANK
	1	2	3	4	5				
Payment delay	6	19	11	105	42	706	3.86	0.772	1st
Inspection delay by managers	11	17	14	103	38	690	3.77	0.754	2nd
Rework	8	30	7	97	41	682	3.73	0.745	3rd
Poor communication between managers & labourers	13	26	8	98	38	672	3.67	0.734	4th
Unavailability of needed tools	3	38	18	97	27	655	3.58	0.716	5th
Lack of labour supervision	10	27	24	97	25	650	3.55	0.710	6th
Shortage of materials	10	35	13	97	28	648	3.54	0.708	7th
Accidents during construction	6	33	31	99	14	631	3.45	0.674	8th
Personal problems of labour	18	29	13	99	24	631	3.45	0.670	9th
Lack of skills of labour	14	44	13	85	27	617	3.37	0.670	9th
Labour dissatisfaction	14	43	12	96	18	609	3.33	0.666	11th
Unsuitability of storage	14	44	16	86	23	609	3.33	0.666	11th
Poor health of labour	8	56	10	89	20	606	3.31	0.662	13th
Misunderstanding of laborers	12	65	19	73	14	562	3.07	0.614	14th
Working overtime	16	62	15	74	16	562	3.07	0.614	15th
Labour absenteeism	18	68	15	68	14	542	2.96	0.592	16th
Site restricted access	42	53	7	61	20	512	2.80	0.559	17th
Physical fatigue	19	84	12	55	13	509	2.78	0.556	18th
Raining	30	69	28	43	13	489	2.67	0.534	19th
Unsuitability rest area on site	24	91	23	38	7	461	2.52	0.504	20th
Delay in responding to requests	29	84	25	37	8	459	2.51	0.502	21st
Power outage	29	90	17	42	5	454	2.48	0.496	22nd
Inadequate coordination	31	84	30	32	6	446	2.44	0.487	23rd
Stringent inspection	33	88	29	26	7	435	2.38	0.475	24th
Variation orders	40	86	25	25	7	423	2.31	0.462	25th
Site layout problems	37	92	24	25	5	417	2.28	0.456	26th
Design complexity level	35	99	23	20	6	412	2.25	0.450	27th
Unclear specifications	45	90	15	28	5	406	2.22	0.443	28th
Labour disloyalty	35	108	19	17	4	395	2.16	0.431	29th
Alcoholism and drug abuse of labours	37	105	19	19	3	395	2.16	0.431	30th
Lack of competition between the Laborers	52	83	17	30	1	393	2.15	0.429	31st
Inadequate transportation for labours	39	104	17	20	3	393	2.15	0.429	32nd
Confinement of working space	42	101	17	19	4	392	2.14	0.428	33rd
Implementation of government laws	48	98	18	18	1	375	2.05	0.410	34th
Shortage of experienced labour	58	87	17	19	2	370	2.02	0.404	35th
High Temperature	58	96	17	11	1	349	1.91	0.381	36th

Table 1 shows the Relative Importance Indices (RII) and the rankings of the factors that affect labour output in construction sites. As indicated in Table 1, thirty-six (36) factors were identified by respondents to affects labour output in construction sites.

As depicted in Table 1, seven items were identified as the main factors that affect labour output in construction sites with RII ≥ 0.7 and mean values ≥ 3.5. these factors in the order of ranking are payment delay, inspection delay by managers, rework, poor communication between managers and labourers, unavailability of needed tools, lack of labour supervision and shortage of materials.

The finding concurs with the study by Attar et al. (2012) noted that unavailability of suitable tools, payment delay, inspection delay, and ineffective management to be a primary cause of low productivity and identified a lack of alignment among goals, contractual conflicts, difficulties in measuring productivity, weak commitments to continuous improvement and a lack of labour force focus as barriers to improving productivity. Reflecting this perspective, Jergeas (2009) reported that there are undue cost overruns, delays and losses of productivity associated with the delivery of major capital construction projects everywhere in the world due to factors such as payment delay, lack of labour supervision, inspection delay, and shortage of materials. Jergeas's study found that researchers and practitioners have identified poor management practices that lead to poor performance, such as scope changes, design errors and omissions, lack of proper planning and scheduling and improper management of tools, equipment, materials and labour, among many other factors.

The view of the construction workers that payment delay affects labour output in construction sites supports the study by Lema (1995), who mentioned that non-financial benefits such as transport, meals, and uniforms have a high effect on labour productivity. Christian and Hachey (1995) indicated that payment delays in the construction industry are adversarial and disastrous.

Late payment affects a company's cash flow and may ultimately lead to a business's failure. Timeliness of payment is important to avoid the risk of the late-payment problem. A study by Zou et al., (2007) pointed out that project-funding problems have been identified as cost-related risks, time-related risks, and quality-related risks which can significantly influence the delivery of a construction project. The risk of delayed payment from the owner impacts the duration and cost of the project. These risks cause the project's cost to increase abnormally and, subsequently, delay the project's progress.

The agreement of the construction workers on inspection delay by site management as a factor that affects labour output aligns with the past studies (Guhathakurta and Yates, 1993; Olomolaiye et al., 1996) that inspection delay negatively affects labour output. Olomolaiye et al., (1996), mentioned that inspection delays are an important process; for example, because contractors cannot cast concrete before inspection of formwork and steelwork, the inspection delay contributes to delays in work activities. It completely stops the task that requires the presence of supervisors, such as casting concrete and backfilling. Additionally, it delays the inspection of completed work which, in turn, leads to a delay in the commencement of new work. According to the study by Fugar and

Agyakwah-Baah (2010) in Ghana, the inability of clients (building owners) to honour payments on time was determined as the first major factor that causes delays in building construction projects in Ghana. Makulsawatudom et al. (2004) on the same issue pinpoint the labour output on-site might be affected negatively by inspection delay by site managers.

The site operative's agreement that rework affects labour output in construction sites agreed with a similar study by Frimpong et al. (2003), who found that reworks are the main factors that cause delay in the construction of projects in Ghana. Alaghbari et al. (2007) study in Malaysia indicated that from a list of thirty-one (31) factors, clients, contractors and consultants agreed that rework were the main factors causing delay. Sweis et al. (2008) studied the causes of delay in residential projects in Jordan and concluded that financial difficulties faced by the contractor and rework orders by the owner are the leading causes of construction delay. Abd El-Razek et al. (2008) in a similar study in Egypt found that the most important cause of delay is rework by contractors during construction projects.

Communication problems identified by the construction workers as a factor that affects labour output buttress with the finding of Hickson and Ellis (2014) that poor communication affects labour output. Hickson and Ellis pinpoint that relaying information from management to labour and vice versa is challenging for both parties but it is essential on the job site. Communication was rated 7th in the productivity categories in Jiukun et al., (2009), 6th in the Makulsawatudom and Emsley (2003) list of critical factors, and 6th in Henry et al., (2007). Inaccurate or ambiguous instruction has been identified as a particular concern for labourers. Fagbenle et al., (2011) indicated that communication affects labour productivity. Fagbenle indicated that for construction labours to be effective, they must clearly understand what is required to be done on site. Communication within organizations is a vital ingredient of motivation. For example, employees are likely to be motivated by recognition and constructive feedback from their line manager.

The agreement that unavailability of suitable tools is the factor that affects labour output supports the study by Paulson (2015), who found that the unavailability of suitable tools affects labour productivity. This result is also supported by Heizer and Render (1990), who confirmed that unavailability of suitable tools on sites affects job site productivity. The finding also concurs with the study by Makulsawatudom and Emsley (2003) who found unavailability of suitable tools as the 2nd factor that affects labour output and the 2nd most important productivity category in Jiukun et al., (2009). Unavailability of suitable tools is due to delinquent project management or as a result of economic constraints on the contractor, this problem could be solved with better planning.

CONCLUSION

Labour output is one of the main determinants of the success of any construction project. The study aimed at determining the factors that influence labour output on construction sites in Ghana. Seven factors were identified as the major factors that affect labour output in construction sites in Ghana. These are payment delay, inspection delay, rework, poor communication, unavailability of needed tools, lack of labour supervision and shortage of materials. The study concludes that labour

output of construction workers in Ghana is affected by several factors. It is recommended that construction managers regularly inspect and pay attention to the quality of construction materials and tools used in projects to eliminate inspection delay and unavailability of needed tools. Regular inspection and use of appropriate materials and tools will reduce both the time taken to finish the work and the wastage of materials.

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