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IMPROVING LABOUR PRODUCTIVITY IN GHANAIAN BUILDING CONSTRUCTION PROJECTS

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Abstract – Labour productivity is key to the success of every construction project. The paper seeks to determine the factors that affect labour productivity and proffer possible ways to improve it in building construction projects. The study was preceded by a literature review. Data used were primary data collected through the use of questionnaires. The total number of respondents was 175. Snowball sampling technique was used in sampling respondents. Factor analysis was performed on the data collected and mean scores were also generated. The findings of the study showed that the use of wrong equipment, misuse of time schedule, lack of training sessions, poor site organisation, lack of motivation for workers, delays in the supply of materials and rework were the critical factors affecting labour productivity in building projects of Ghana. However, the major ways of improving labour productivity in building construction projects, according to the study, were to correct bad behaviour that negatively influenced productivity, proper layout of site, to improve health and safety, to use proper materials handling systems and to set targets for employees. Management must put structures in place to restrict human, material and construction related factors. This is because giving concessions in these areas can take a toll on productivity.

Keywords*: Building construction projects, factor analysis, labour productivity*.

INTRODUCTION

The importance of labour in construction project delivery cannot be underestimated. Though a lot of resources are deployed during the execution of a project, men stand tall among them all. Jha (2011) postulated that human resources constituted one of the greatest resources in every project. McTague and Jergeas (2002) said that labour cost took from 30 % to 50 % of the total cost of projects in many countries. Tucker (1986) indicated that men had remarkable influence on productivity which made them superior resource in firms' operation.

The optimal use of human resource in every construction business increases productivity and, therefore, any firm with the desire to stay on top cannot undermine its workforce. Horner, Talhouni & Thomas (1989) indicated that an increase of

10 % in construction labour productivity would yield approximately billion savings annually to the British economy. Sezer (2016) underscored that available statistics on productivity in the construction industry in most countries was low. Regrettably, Ghana is not an exception. This is because one of the most challenging issues the Ghanaian construction industry is faced with is low labour productivity, which occurs as a result of incompetent site supervision, insufficient knowledge about the factors that influence productivity, lack of employees' commitment to work, lack of motivation from management, fatigue and unrealistic scheduling, among others. The study seeks to establish the factors that actually influence labour productivity in Ghanaian building construction projects to be able to provide mitigation measures for improvement.

1. PRODUCTIVITY

Productivity is a very vital subject that affects the overall performance of a firm. It is 'working smarter', rather than 'working harder', through the use of innovation, technology, new and workable business models by combining inputs (Organisation for Economic Co-operation and Development (OECD), 2015). The subject of productivity has received imperative attention because of its correlation with economic growth (Sezer, 2016). There are a number of factors that directly or indirectly affect labour productivity. Improving productivity in firms' operations has an inverse relationship with unit cost of a project. A vast number of activities involved in construction operations make labour management a topical issue (Khaled & Mostafa, 2011). Many firms have developed their own means of measuring productivity depending on their definition of productivity. The American Association of Cost Engineers defined productivity as a 'relative measure of labour efficiency, either good or bad, when compared to an established base or norm' (Allmon, Haas, Borcherding & Goodrum, 2000). Peles (1987) defined productivity in simple terms as 'the performance accomplished by operatives. Dozzi and AbouRizk (1993) referred to it as 'the physical progress achieved per persons-hour'. They identified the two important measures of labour productivity: making good use of labour and ensuring that employees perform their task within a given time and place. Durdyev, Ismail & Kandymov (2018) explicated that effective productivity within the construction industry had a tremendous effect on national economy. Dozzi and AbouRizk (1993) emphasised that improved productivity required a change of mind-set in the way construction activities were perceived in the course of production. They stated that construction processes should not just be viewed as series of isolated events or subjects but rather as complete systems, in which every element would have a certain degree of impact on the overall success of a project. The construction process as a system includes material, personnel or men, equipment, time, management, and money, which are consumed during the course of production.

To monitor productivity, the actual cost of production should be matched with estimates. An increase in actual cost over estimated cost is a sign of a downward trend in productivity. A scenario of such nature requires an examination of all inputs

to establish the cause of variance in productivity. Whatever be the case, management decision will be critical in arresting such an unwanted event.

2. FACTORS AFFECTING PRODUCTIVITY

The success of every project depends on several factors (Adams, 1989; Alinaitwe, Mwakali & Hanson, 2007; Hanna, Chang, Lackney & Sullivan, 2007; Horner *et al*., 1989; Watkins *et al*., 2009; Jarkas, 2010). Fugar and Agyarkwah (2010) categorised the factors impacting productivity in the Ghanaian Construction Industry (GCI) into six groups, namely: materials, labour force, scheduling and controlling, environmental changes, contractual relationships, financial and government action. Amoah, Ahadzie & Dansoh (2010), however, grouped the factors into two, namely: governments' fiscal policies and management related issues. Jergeas (2009) and Siebers *et al*. (2008) outlined poor management practice as a factor affecting productivity. Hewage and Ruwanpura (2006), on the other hand, classified factors affecting productivity into nine groups: design and changes, lack of planning, poor communication, non-availability of information, skills of worker, site congestion, worker motivation, poor supervision, and inclement weather. Ritz (1994) attributed poor labour productivity to: poor supervision, personnel shortage, missing materials, poor operating systems, incomplete design documents and poor communication. He stated that all these were management related challenges and that no matter how many categories you put them into, it would still come back to management practices.

Franklin (2017) claimed that employees with negative perception about a firm were less likely to put in their best. Job fit, technical training, tools and equipment, morale and organisational culture were identified as some of the factors that could impact labour productivity (Mazin, 2017). Hawthorne (2017) underscored that an increase in worker motivation and involvement in decision making, poor working environment, and managers' and supervisors' recognition of worker needs could also play a negative or positive role in productivity. Nonetheless, Dai, Goodrum & Maloney (2009a) and Dai, Goodrum, Maloney & Srinivasan (2009b) stated that there were many factors influencing productivity. Guo *et al*. (2015) noted that workers who would work under fatigue and a lot of pressure due to unrealistic goals might underperform in the long run, and would have dire consequences for productivity. According to HSE (2017), directly involving employees in health and safety issues enhances productivity and also wins their loyalty. It creates a sense of worth, improves motivation and overall efficiency of employees. Their inclusion in decision making upsurges their confidence, knowing that management cares about their safety and welfare. Jha (2011) indicated that productivity could be influenced if firms through supervisors or management communicated lessons learned from previous projects as feedback to employees. He emphasised that failure to fulfil employment terms and conditions, job insecurity, poor working conditions, recurrent employee transfer, extensive changes in project scope, conflicts between supervisors and employees, over-assigning employees for tasks, insufficient instructions, poor sequencing of activities, frequent shortage of materials and tools,

lack of performance targets, non-existence of feedback loop, lack of motivation, etc. among other things were the causes of low labour motivation influencing productivity.

3. RESEARCH METHODOLOGY

The study started by first reviewing relevant literature to identify the factors affecting labour productivity. This was succeeded by the development of a structured questionnaire. The five-point scaled questionnaire after development was given to three certified engineers from the Institution of Engineering and Technology, Ghana (IET, Ghana) with rich experience in the industry to validate and make their inputs. The final questionnaire was completed by incorporating the suggestions made by the experts. The questionnaire was sub-divided into four main parts: special response part, reasons for productivity measurement in the building construction industry, factors affecting labour productivity and ways of improving labour productivity. Data were collected using questionnaire. The study population included clerk of works, site engineers, trades foremen, operation managers and construction managers of D_1K_1, D_2K_2 and D_3K_3 contractors actively working on diverse building projects all over Ghana. These are contractors with financial classifications in excess of USD 500 000, up to USD 500 000 and up to USD 200 000, respectively. A snowball sampling approach was used to select the sample for the study. The use of snowball was simply to find the right respondents who were willing to share their experience and knowledge based on the information required (Bernard, 2002; Lewis & Sheppard, 2006; Tongoco, 2007). The questionnaires were distributed electronically using WhatsApp social media platform and by hand, and were retrieved through the same means. The use of the WhatsApp electronic platform in the survey was aimed at improving the response rate of the study since these professionals were scattered all over Ghana. A total of 175 respondents were sampled using this technique. The use of the social media platform was very helpful as it offered researchers the opportunity to send quick reminders to respondents to remind them of the collection date of questionnaires.

Data collected were analysed quantitatively by first determining the means and standard deviations of the various factors and also the variabilities among the observed variables. Factor analysis was performed on the data collected. Non-observable and non-measurable latent variables were first identified by factor extraction and factor rotation. A rotation of the extracted factors was undertaken to gain meaningful and interpretable factors. In order to extract the latent factors affecting labour productivity and ways of improving it, the factors were subjected to principal component (PC) with varimax rotation. The extraction of the factors was based on their factor loadings. The greater the loading, the higher the variable's status as a pure measure of the factor. This led to the use of the Kaiser-Meyer-Olkin measure (KMO) of Sampling Adequacy and Bartlett's Test of Sphericity. A KMO higher than 0.040 and a Bartlett's Test of Sphericity being statistically significant at 0.05 support the factorability of a data set. It implies that factor analysis is suitable for extracting latent factors.

4. DATA ANALYSIS AND DISCUSSION

Respondents' Background

a) Classification of Firms

It was revealed that 139 of the subjects representing 80 % who took part in the study were employed by class D_1K_1 firms, 20 representing 11 % were engaged by D_2K_2 firms, and the remaining 16 representing 9 % were employed by D_3K_3 firms. The outcome of the result indicates that most of the respondents were employed by class one (D_1K_1) contractors. In Ghana, the classification of Building and Civil Engineering contractors is based on financial thresholds. Class – 1 contractors (D_1K_1) can undertake projects in excess of (USD 500 000). They are considered limitless. Class – 2 contractors (D_2K_2) can undertake projects up to (USD 500 000); Class – 3 (D_3K_3) have a financial ceiling of up to (USD 200 000), while Class – 4 (D_4K_4), the least classified contractors, have a ceiling of up to (USD 75 000) (Akomah, Zakari & Ayeh, 2020).

b) Designation of Respondents

Data collected indicated that 41 out of the 175 respondents were clerk of works, 101 were site engineers, 19 were operation managers, while 14 were construction managers. The distribution shows that majority of the respondents were site engineers.

c) Existence of Productivity Policy

The study sought to find out whether firms had productivity policies in place, and it was revealed that 168 out of the 175 respondents representing 96 % of the total subjects sampled had productivity policies in their firms. However, 7 representing 4 % indicated that they did not come across any policy like that in their firms. The result is encouraging because it shows that most firms are gradually appreciating the importance of productivity in modern day construction business. The reason why productivity must be an important subject for every construction firm is because, according to OECD (2015), the main driver of growth in the years ahead will be productivity.

d) Who is Responsible for Productivity Policy?

When the question of who is responsible for formulating and implementing productivity policy was asked, only 168 of the respondents replied. It was indicated by 130 respondents representing 77.4 % that the formulation and implementation of productivity policy was the responsibility of site engineers, while 5 representing 3.0 % pointed out to trades foremen. The remaining 33 representing 19.5 %, on the other hand, alluded that it was the responsibility of operation managers. Productivity policy document specifies the rules, regulations, and guidelines

governing employees' attitude and behaviour towards work. It places emphasis on continuous improvement and the target of a firm. This document with the future at sight should not be drawn by one individual but through the collective effort of all professionals constituting the project execution team. Productivity policies are good for construction firms' operations; therefore, the formulation of such policies must have bigger ends in view (Banks, 2012).

e) Standard Labour Outputs

A question was posed to find out whether respondents' firms had their own standard labour outputs; 169 respondents responded 'yes', while the remaining 6 responded 'no'. With such information in the domain of firms, one would want to find out why some of them could not still complete projects on schedule even when there were no external constraints. In an attempt to improve the performance of firms in terms of productivity in today's global competitive market, it will always be prudent to measure the output of workers to find out whether they are underperforming or not. This is because it is the simplest means of measuring productivity (Muriel, Phillips & Sibieta, 2010).

f) Productivity Measurement and Tools

Out of the 175 respondents, 170 responded 'yes' to signify that their firms undertook productivity measurement, 5, however, responded 'no'. The result suggests that most firms have keen interest in productivity. The result reveals that 120 respondents representing 70.6 % of the 170 respondents who responded 'yes' measured productivity against labour output, 38 representing 22.4 % measured productivity against estimates, whereas 12 representing 7.1 % measured firms' productivity against other projects. The picture depicted implies that most firms measured productivity against labour output. It was discovered that 100 respondents representing 58.8 % used work measurement techniques as a tool for measuring productivity, 19 representing 11.2 % used method study, while 51 representing 30.0 % combined both. The Institute of Management Services (2020) defined work measurement as the systematic process involved in the establishment of the time required for a given task to be performed by a qualified worker under defined level of performance. Having an idea about a particular technique for measuring work is not enough, what is most critical is the basic procedure involved: the three-pronged approach of analysing, measuring and synthesising, and the considerations leading to the selection of the measuring technique. When the procedure is wrong, the end result would automatically be wrong. Shivam (2020) averred that work measurement was an important contributor to organisational productivity.

Reasons for Productivity Measurement

The result in Table 1 shows the agreement of respondents to reasons for productivity measurement. The five factors had a mean range of 3.95 to 4.49, and a standard deviation range of 0.680 to 0.836. Respondents strongly agreed that the

major reason for undertaking productivity measurement was to 'improve industry performance'. The factor scored a mean value of 4.49, and a standard deviation of 0.736. The dynamics in global business competition in the construction industry is changing by day with clients preferring firms who are efficient and effective in their deliveries to inefficient ones. This, therefore, requires that firms build the needed capacity to improve upon their standing in the industry to attract clients if they are to stay in business. The construction industry competes with other industries in terms of contribution to GDP, which means that the industry can improve its fortunes and performance against other industries through the use of highly efficient and effective work methods. Workers' motivation was ranked second with a mean of 4.37 and a standard deviation of 0.745. Cetin (2013) argued that the productivity of a firm could be improved through employee motivation but advanced that employers had to first identify the needed encouragement tool that would yield the necessary result. Cox, Issa & Koblegard (2005) and Barg, Ruparathna, Mendis & Hewage (2014) opined that motivation was a drive seeking to satisfy and fulfil a need. Pinder (1998) said that motivation was the activation of the inherent energy of an employee with the aim of improving productivity and achieving organisational goals. On the other hand, to 'increase output' was ranked third by respondents with a mean of 4.33 and a standard deviation of 0.680. Dozzi & AbouRizk (1993) highlighted that one way of increasing productivity was to motivate employees. Shehata & El-Gohary (2011) admitted that productivity increase would be achievable through efficient and effective utilisation of firms' resources. The onus, therefore, lies on management of construction firms to manage their limited resources judiciously. The output of workers must be sustained at all costs by management if they have an eye on increased prosperity and sustained growth (Muriel, Phillips & Sibieta, 2010). The least ranked factor was 'elimination of waste' with a mean of 3.95 and a standard deviation of 0.836. Respondents believed that the other factors were more important to the underlying concept of productivity measurement than concentrating on waste elimination. If structures are consciously put in place and management is committed to its responsibilities, eliminating waste will be a natural phenomenon.

Table 1. Reasons for Productivity Measurement

Goals of productivity measurement	*N*	Mean	Std. Dev.	Rank
Elimination of waste	175	3.95	0.836	5
Curb construction delays	175	4.05	0.818	4
Increasing output	175	4.33	0.680	3
Workers' motivation	175	4.37	0.745	2
Improving industry performance	175	4.49	0.736	1

Factors Influencing Labour Productivity

Information provided in Table 2 places 'the use of wrong equipment' above all other factors. It was seen by respondents as the most important factor affecting labour productivity with a mean score of 4.85, and a standard deviation of 0.367. The use of wrong equipment has debilitating effect on output, which influences overall productivity. Apart from its influence on output, it increases cost and time. Misuse of time schedule and lack of training sessions were ranked second and third with mean scores of 4.67 and 4.41, and standard deviations of 0.296 and 0.865, respectively. Line supervisors must always ensure that tasks start on time to avoid delays. Every minute wasted has the probability of pushing project completion beyond schedule. Soekiman, Pribadi, Soemardi & Wirahadikusumah (2011) disclosed that the factors influencing schedule varied and would therefore require management effort to overcome them to harness their goals. Organising training for workers should be an essential component of every firm because it positions them well for the achievement of organisational objectives. It helps instil dynamic values and direction. Training sessions provide avenues for management to communicate the level of productivity and what it intends to do to upsurge it to the firm's advantage. The fourth place was taken by 'poor site organisation' with a mean of 4.38 and standard deviation of 0.709. The provision of congenial environment and adherence to the needs of employees contribute to increase productivity on site. Nonetheless, 'increasing number of labourers' and 'insufficient lighting' were ranked 38th and 39th, respectively. Prior to increasing labour for a particular task, management must undertake a thorough evaluation before employees are assigned to avoid congestion of the task environment. Over-assigning workers is detrimental rather than beneficial to productivity. Where visibility surrounding a task environment is poor, it is prudent to enhance the lighting condition of the environment. Environment with poor lighting slows the pace of employees because they become overly conscious of the environment by protecting themselves against any harm or danger. Insufficient lighting around the task environment raises high safety concerns.

Table 2. Factors Affecting Labour Productivity in Construction Firms

Labour productivity factors	*N*	Mean	Std. Dev.	Rank
Accidents	175	4.00	0.903	37
Construction method	175	4.23	0.725	12
Alternating drawings and specifications during execution	175	4.21	0.828	16
Government regulation/policies	175	4.14	0.709	21
High quality of required work	175	4.02	0.965	36
Increasing number of labourers	175	3.97	0.943	38
Inefficiency of equipment	173	4.14	0.718	22
Inspection delay	175	4.28	0.740	11
Insufficient means of transportation	175	4.13	0.766	25

Insufficient lighting	175	3.86	0.937	39
Labour absenteeism	175	4.02	0.830	35
Labour disloyalty	175	4.14	0.822	23
Lack of competition	175	4.08	0.919	33
Lack of financial motivation system	173	4.20	0.876	18
Lack of labour experience	175	4.20	0.788	17
Lack of periodic meeting with labour	173	4.08	0.821	32
Labour personal problems	175	4.13	0.755	24
Lack of place for eating and relaxation	175	4.07	0.971	34
Lack of training sessions	175	4.41	0.865	3
Low quality of raw materials	175	4.21	0.804	15
Material shortage	175	4.33	0.825	8
Misunderstanding among labourers	175	4.11	0.815	29
Misunderstanding between labourers and superintendents	175	4.13	0.814	27
Misuse of time schedule	173	4.67	0.296	2
Payment delays	175	4.29	0.728	9
Rework	175	4.35	0.678	7
Supervisors' absenteeism	175	4.27	0.736	10
Tool and equipment shortage	175	4.23	0.756	13
Types of activities in the project	175	4.17	0.720	20
Unsuitability of material storage location	175	4.13	0.814	27
Violation of safety precautions	175	4.10	0.759	30
Weather changes/conditions	175	4.17	0.665	19
Working overtime	173	4.09	0.787	31
Inadequate communication	175	4.23	0.769	14
Lack of required skilled labour	175	4.13	0.763	26
Delay in material supply	175	4.37	0.746	6
Poor site organisation	175	4.38	0.709	4
Lack of worker's motivation	175	4.37	0.737	5
The use of wrong equipment	175	4.85	0.367	1

Improving Labour Productivity

There are several ways of improving productivity. Table 3 shows a number of ways of improving productivity in the construction industry. Figures presented in the table below show mean range and standard deviation of 4.29 to 4.78 and 0.177 to 0.804, respectively. Respondents ranked 'correction of bad behaviour that negatively influences productivity' as the most important factor, signifying that at the crux of productivity improvement there are employees' behaviour and attitude towards work. The factor recorded mean score of 4.78 and standard deviation of 0.177. Meier (2020) said that negative attitudes affected performance behaviour and

reiterated that they were bad for business growth. Positive attitudes are what turn the fortunes of a firm and bring about wealth creation. It is therefore essential for managers and supervisors to clamp down on any behaviour that has the tendency to create a reversal in a firm's growth. Proper site layout and improved health and safety were ranked second and third with mean scores of 4.52 and 4.50, and standard deviation of 0.678 and 0.566, respectively. Efficient site layout limits double handling, overcomes delays, creates conducive environment for workers to perform, enhances safety and health on site, and creates effective mobility. Improved health and safety have direct bearing on productivity. Akomah, Boakye & Fugar (2010) and Nimo Boakye, Akomah & Fugar (2010) argued that the occurrence of accidents would create hold-ups and impede smooth running of operations on-site. They said this could lead to loss of man-days or hours as a result of lost-time injuries and reportable lost time-injuries. Proper motivation was considered the least ranked factor.

Table 3. Ways of Improving Labour Productivity

Factors for improving productivity	***N***	**Mean**	**Std. Dev.**	**Rank**
Introducing modular construction	175	4.39	0.624	9
Improving health and safety	175	4.50	0.566	3
Proper site layout	173	4.52	0.678	2
Proper material handling	175	4.50	0.624	4
Good communication channels	175	4.30	0.804	14
Proper motivation	175	4.29	0.765	15
Setting targets for workforce	175	4.46	0.692	5
Appreciating the efforts and contribution of workforce	175	4.40	0.634	8
Clear guidelines and approach to work	173	4.35	0.697	12
Correction of bad behaviour that negatively influences productivity	175	4.78	0.177	1
Coordination among team members/gangs	175	4.43	0.691	7
Provision of the right environment for workers to work	175	4.31	0.725	13
Avoidance of material shortage	175	4.39	0.718	10
Satisfying the welfare needs of workers	175	4.38	0.684	11
Good relationship between supervisor and workforce	175	4.43	0.647	6

To respondents, other issues are more pressing than just proper motivation. Correction of bad behaviour towards work, improved health and safety, proper site layout, proper material handling systems, setting targets for employees, among others, were found to be more pressing than proper motivation. Properly motivating employees without putting systems and structures in place would not yield the needed result. What brings the results is when there is a balance. Construction

labour productivity contributes significantly to national economy and must at all times be improved and sustained (Hamza *et al*., 2019).

Factor Analysis

A) Latent Factor Analysis Outcomes for Factors Affecting Labour Productivity

In order to extract the latent factors for factors affecting labour productivity, 39 items were subjected to principal component (PC) with varimax rotation. Factors were extracted based on their factor loadings. A factor was considered for inclusion if its factor loading exceeded 0.4. This is because a higher factor loading creates higher variability status, which is considered as a pure measure of the factor. Assessing the suitability of the data for factor analysis, the main issue of concern was the strength of the relationship among the variables or items for factors affecting labour productivity. Kaiser-Meyer-Olkin Measure (KMO) of Sampling Adequacy and Bartlett's Test of Sphericity were used for the assessment of the strength and relationship among various factors.

KMO of 0.659 was registered and Bartlett's Test of Sphericity was statistically significant at 0.05 as illustrated in Table 4. This supported the factorability of the data set and allowed using factor analysis for the extraction of the latent factors affecting labour productivity.

Table 4. KMO and Bartlett's Test for Factors Affecting Productivity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.659**
Bartlett's Test of Sphericity	Approx. Chi-Square	3355.426
	Df	741
	Sig.	0.000

It was discovered that some variables under factor 1, 2, 3, 4 and 5 had their factor loadings exceeding the threshold 0.4, which gave them good representation of their respective factors as illustrated in Table 5. However, in the first component nine variables had their thresholds below 0.4, thus, making those variables poor representatives of their factors. For the first component, nine variables exceeded the 0.4 threshold as indicated in the table below. These variables were classified as human related factors because factors under this component were more human-centred. The sustainability and competitive edge of every firm depends, to a large extent, on human resources, which makes human capital a big asset for success in any construction firm (Gratton, 2000; Jha, 2011; Asibuodu & Stewart, 2015). The second component had four variables exceeding the factor loadings of 0.4. The four variables were as follows: "increasing number of labourers, material shortage, supervisors' absenteeism and tool and equipment shortage". The second component was categorised under management related factors.

Table 5. Factors Affecting Labour Productivity

	Component				
Influencing factors of labour productivity	**1**	**2**	**3**	**4**	**5**
Insufficient lighting	0.627				
Labour absenteeism	0.666				
Lack of labour experience	0.533				
Lack of periodic meeting with labour	0.639				
Labour personal problems	0.548				
Lack of place for eating and relaxation	0.407				
Misunderstanding among labourers	0.505				
Misunderstanding between labourers and superintendents	0.595				
Low quality of raw materials	0.658				
Increasing number of labourers		0.472			
Material shortage		0.525			
Supervisors' absenteeism		0.632			
Tool and equipment shortage		0.531			
Inadequate communication			0.473		
Lack of training sessions			0.590		
Type of activities in the project			0.584		
Government regulation/Policies			0.560		
High quality of required work			0.584		
Accidents				0.638	
Construction method				0.692	
Alternating drawings and specifications during execution				0.545	
Misuse of time schedule				0.416	
Payment delays				0.631	
Unsuitability of material storage location				0.510	
Violation of safety precautions				0.533	
Inefficiency of equipment					0.684
Inspection delay					0.646
Lack of required skilled labour					0.449
Delay in material supply					0.529
Lack of worker's motivation					0.497

The third component had five items with factor loadings exceeding 0.4 and were classified under project related factors. Meanwhile, the fourth component recorded seven items, while the fifth component had five items with both having their factor loadings exceeding the threshold of 0.4 and were categorised under construction related factors and constraint related factors, respectively.

B) Latent Factor Analysis Outcomes for Ways of Improving Productivity

All the 15 items on ways of improving productivity were also subjected to principal component (PC) with varimax rotation. A factor was extracted if its factor loading exceeded 0.4. The KMO obtained was 0.687 and Bartlett's Test of Sphericity was also statistically significant at 0.05 as recorded in Table 6.

Table 6. KMO and Bartlett's Test for Ways of Improving Productivity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.687**
Bartlett's Test of Sphericity	Approx. Chi-Square	655.834
	Df	105
	Sig.	0.000

Table 7. Ways of Improving Productivity

	Component			
How to improve labour productivity	**1**	**2**	**3**	**4**
Coordination among team members/gangs	0.580			
Provision of the right environment for workers to work	0.741			
Good communication channels	0.630			
Proper motivation	0.638			
Setting targets for workforce	0.604			
Improving health and safety		0.576		
Satisfying the welfare needs of workers		0.839		
Good relationship between supervisor and workforce		0.658		
Proper site layout			0.788	
Proper material handling			0.588	
Clear guidelines and approach to work			0.611	
Correction of bad behaviour that negatively influences productivity				0.728
Avoidance of material shortage				0.474
Appreciating the efforts and contribution of workforce				0.545

The factor analysis revealed that some variables under components 1, 2, 3, and 4 had their factor loadings exceeding 0.4. However, most of the variables also had their thresholds below 0.4, which gave them poor representation of their factors. For the first component, five variables exceeded the threshold of 0.4, namely: 'coordination among team members/gangs, provision of the right environment for workers to work, good communication channels, proper motivation, and setting

targets for workforce'. These variables were grouped under management related factors. The second component and third component had four and three variables, respectively, with each having its factors surpassing the factor loading of 0.4. The four items under the second component were identified as human related factors, while those under the third component were categorised as material related factors. The fourth component recorded three items with their thresholds exceeding 0.4 and were grouped under productivity related factors. If productivity has to be influenced in firms' operations, it has to be a positive influence and not detrimental because that is what sustains the financial health of every firm (Durdyev and Mbachu, 2011). Negative trends in productivity have long-term consequences for firms' sustainability. According to Banks (2012), enhanced productivity has a positive correlation with the living standards of workers. It enriches the image and life of firms and contributes to the economic growth of nations.

5. SUMMARY OF FINDINGS

The study revealed that majority of the respondents worked for D_1K_1 contractors. Most of the firms that have engaged respondents have productivity policies. Majority of the respondents (130) out of the 168 who answered this question indicated that the formulation and implementation of productivity policies were the responsibility of site engineers.

The result shows that majority of the firms have their own standard labour outputs. Almost all the respondents (170) indicated that they undertook productivity measurement in their respective firms. Out of the immediate figure stated above, 120 affirmed they measured productivity against labour output, 38 measured productivity against estimates, while the rest (12) indicated that they measured productivity against other projects. According to 100 respondents, their firms used work measurement as a tool for measuring productivity, 19 indicated that they used method study and 51 revealed that they used a combination of the two.

It was discovered, however, that the key reasons why firms undertook productivity measurement were to improve industry performance, motivate workers, and improve output.

The use of wrong equipment, misuse of time schedule, lack of training sessions, poor site organisation, lack of motivation for workers, delays in the supply of materials and rework were found to be the first six most critical factors affecting labour productivity. The study identified through the mean ranking that correction of bad behaviour that could negatively influence productivity, proper site layout, improving health and safety, proper material handling and targets setting for workforce were some of the major ways of improving productivity.

KMO of 0.659 and 0.687, and Bartlett's Test of Sphericity being statistically significant at 0.05 supported the factorability of the data set, which led to the use of factor analysis for the extraction of the latent factors for factors affecting productivity and ways of improving productivity.

The average factor loading of each component under factors affecting labour productivity reveals that human, construction and constraint related factors are the

most pressing factors that affect productivity. Interestingly, it was also discovered that productivity could be improved if human related factors were managed very well in building projects by management. Material related factors were considered the second most influential factors in productivity improvement, followed by management related factors.

CONCLUSIONS

The growing awareness of labour productivity as a subject among Ghanaian construction firms is encouraging. To sustain this interest, firms must come out with comprehensive productivity policies formulated and implemented by senior management and production line managers. Management has a responsibility to communicate the intentions of the firm through its policies to employees to ensure smooth implementation and adherence. The formulation of these policies should not be handled by one person in a firm as depicted by the results obtained in this study but must be a collective effort of all senior management members and production line managers. Though, the results show that firms have productivity policies, their existence could not be felt in the industry.

Based on the findings, it can be summarised that firms have standard labour outputs; they measure productivity and have an idea of some of the productivity measuring tools. Unfortunately, their knowledge about the tools mentioned in the study is not making any impact on their operations in the country. The core reasons for management undertaking productivity measurement according to the results should be to improve their performance in the industry, to find ways of motivating workers to get the best out of them, and finally to improve their output.

Thus, management must maintain a well organised site, improve health and safety, have proper material handling systems in place, set targets for workers and above all put measures in place to correct bad behaviour that negatively influences productivity. Finally, management should take keen interest in human, material and construction related factors. This is because compromises in these areas can greatly affect productivity and the wellbeing of construction projects in general.

REFERENCES

Abramovsky, L., Bond, S., Harrison, R., & Simpson, H. (2005). Election Briefing Note No. 6. London, United Kingdom: The Institute for Fiscal Studies.

Adams, S. (1989). Practical Buildability. Construction Industry Research and Information Association (CIRIA), Building Design Report.

Agyarkwah-Baah, A., & Fugar, F. DK. (2010). Delays in Building Construction in Ghana. *Australian Journal of Construction Economics and Building*, *10*(1/2), 103–116. https://doi.org/10.5130/ajceb.v10i1/2.1592

Akomah, B. B., Boakye, N. A., & Fugar, F. D. K. (2010). Safety on construction sites: The role of the employer and employee. In S. Laryea, R. Leiringer, & W. Hughes (Eds.). *Proceedings of the West Africa Built Environment Research (WABER) Conference* (pp. 477–49). Accra, Ghana.

Akomah, B. B., Zakari, M., & Enoch Ayeh, E. (2020). Impact of Cost of Construction Projects in Cape Coast Metropolis. *Buletinul Institutului Politehnic Din Iaşi*, *66*(1), 95–112.

Alinaitwe, H., Mwakali, J., & Hanson, B. (2007). Factors Affecting the Productivity of Building Craftsmen - Studies of Uganda. *Journal of Civil Engineering and Management*, *13*(3), 169–176. https://doi.org/10.3846/13923730.2007.9636434

Allmon, E., Haas, C. T., Borcherding, J. D., & Goodrum, P. M. (2000). U.S. Construction Labour Productivity Trends, 1970–1998. Journal of Construction Engineering and Management, *126*(2), 97–104. https://doi.org/10.1061/(ASCE)0733-9364(2000)126:2(97)

Amoah, P., Ahadzie, D. K., & Dansoh, A. (2007). The Factors Affecting Construction Performance: The Perspective of Small-Scale in Ghana Building Contractors. *The Ghana Surveyor Journal*, *4*(1), 41–48.

Asibuodu, U. R., & Stewart, P. (2015). Investigating Factors that Influence Construction Productivity - A Review of the Literature. United Kingdom: University of Salford Manchester.

Banks, G. (2012). Productivity policies: the 'to do' list. Economic and Social Outlook Conference, 'Securing the Future'. Melbourne, Australia: Productivity Commission.

Barg, J. E., Ruparathna, R., Mendis, D., & Hewage, K. N. (2014). Motivating Workers in Construction. *Journal of Construction Engineering*, 1–11. https://doi.org/10.1155/2014/703084

Bernard, H. R. (2002). *Research Methods in Anthropology: Qualitative and Quantitative Methods* (3rd ed.). California, USA: Alta Mira Press.

Cetin, I. (2013). Motivation and its impact on labour productivity at hotel business "a conceptual study". *International Journal of New Trends in Arts, Sports & Science Education*, *2*(1), 70–79.

Cox, R. F. Issa, R. R. A. and Koblegard, K. (2005). Management's perception of key behavioural indicators for construction. *Journal of Construction Engineering and Management*, *131*(3), 368–376. https://doi.org/10.1061/(ASCE)0733-9364(2005)131:3(368)

Dai, J., Goodrum, P. M., & Maloney, W. F. (2009a). Construction Craft Workers' Perceptions of the Factors Affecting their Productivity. *Journal of Construction Engineering and Management*, *135*(3), 217–226. https://doi.org/10.1061/(ASCE)0733-9364(2009)135:3(217)

Dai, J., Goodrum, P. M., Maloney, W. F., & Srinivasan, C. (2009b). Latent Structures of the Factors Affecting Construction Labour Productivity. *Journal of Construction Engineering and Management*, *135*(5), 397–406. https://doi.org/10.1061/(ASCE)0733-9364(2009)135:5(397)

Dozzi, S., & AbouRizk, S. (1993). Productivity in construction. Ottawa, Canada: National Research Council.

Durdyev, S., Ismail, S., & Kandymov, N. (2018). Structural Equation Model of the Factors Affecting Construction Labour Productivity. *Journal of Construction Engineering and Management*, *144*(4), 04018007. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001452

Durdyev, S., & Mbachu, J. (2011). On-Site Labour Productivity of New Zealand Construction Industry: Key Constraints and Improvement Measures. *CEB*, *11*(3), 18–33. https://doi.org/10.5130/AJCEB.v11i3.2120

Franklin, J. (2017). *Behavioural factors in human resource planning.* Retrieved from https://bizfluent.com/list-6557409-behavioral-factors-human-resource-planning.html

Gratton, L. (2000). *Living strategy: putting people at the heart of corporate purpose*. London, United Kingdom: Pearson Education Limited.

Guo, B. H., Yiu, T. W., & González, V. A. (2015). Identifying Behaviour Patterns of Construction Safety Using System Archetypes. *Accident Analysis Prevention*, *80*, 125–141. https://doi.org/10.1016/j.aap.2015.04.008

Hamza, M., Shahid, S., Bin Hainin, M. R., & Nashwan, M. S. (2019). Construction Labour Productivity: Review of Factors Identified. *International Journal of Construction Management*, *19*, 1–13. https://doi.org/10.1080/15623599.2019.1627503

Hanna, A., Chang, C-K., Lackney, J., & Sullivan, K. (2007). Impact of Overmanning on Mechanical and Sheet Metal Labour Productivity. *Journal of Construction Engineering and Management*, *133*(1), 22–28. https://doi.org/10.1061/(ASCE)0733-9364(2007)133:1(22)

Hawthorne, M. (2017). Objectives of motivation in the workplace. Retrieved from https://bizfluent.com/info-8747634-objectives-motivation-workplace.html

Hewage, K. N., & Ruwanpura, J. Y. (2007). Carpentry Workers Issues and Efficiencies Related to Construction Productivity in Commercial Construction Projects in Alberta. *Journal of Civil Engineering Canadian*, *33*(8), 1075–1089. https://doi.org/10.1139/l06-050

Horner, R. M. W., Talhouni, B. T., & Thomas, H. R. (1989). Preliminary results of major labour productivity monitoring programme. Paper presented at *3rd Yugoslavian Symposium on Construction Management, Cavtat*., 18–28.

HSE (2017). Measuring performance. Retrieved from https://www.hse.gov.uk/managing/delivering/check/measuring-performance.htm

Jarkas, A. M. (2010). The Impacts of Buildability Factors on Formwork Labour Productivity of Columns. *Journal of Civil Engineering and Management*, *16*(4), 471–483. https://doi.org/10.3846/jcem.2010.53

Jergeas, G. (2009). *Improving Construction Productivity on Alberta Oil and Gas Capital Projects*. Alberta, Canada: Alberta Finance and Enterprise.

Jha. K. N. (2011). *Construction project management: Theory and practice*. Delhi, India: Pearson Education India.

Khaled M. EI-G., & Mostafa E. S. (2011). Towards Improving Construction Labour Productivity and Projects Performance. *Alexandria Engineering Journal*, *50*, 321–330. https://doi.org/10.1016/j.aej.2012.02.001

Lewis, J. L., & Sheppard, S. R. J. (2006). Culture and Communication: Can Landscape Visualization Improve Forest Management Consultation with Indigenous Communities? Landscape and Urban Planning, *77*(3), 291–313. https://doi.org/10.1016/j.landurbplan.2005.04.004

Mazin, R. (2017). Factors that affect employee performance in an organization. Retrieved from https://bizfluent.com/how-7630782-improve-team-work.html

Mctague, B., & Jergeas, G. (2002). Productivity improvements on Alberta major construction projects. Construction Productivity Improvement Report, Project Evaluation Tool. Alberta, Canada: Alberta Economic Development.

Meier, K. S. (2020). How Does Behavior Affect Work Performance? Retrieved from https://work.chron.com/behavior-affect-work-performance-4476.html

Muriel, A., Phillips, D., & Sibieta, L. (2010). Living Standards, Inequality and Poverty: Labour's Record, IFS 2010 Election Briefing Note 2 (IFS BN89). Retrieved from http://www3.weforum.org/docs/WEF_Forum_IncGrwth.pdf

Nimo Boakye, A., Akomah, B. B., & Fugar, F. D. K. (2010). Ensuring the Health and Safety of Ghanaian Construction Workers by Decentralised Government Agencies: An Exploratory Study. In S. Laryea, R. Leiringer, & W. Hughes (Eds.). *Proceedings of the West Africa Built Environment Research (WABER) Conference* (pp. 295–304). Accra, Ghana.

Organization for Economic Cooperation and Development. (2015). The future of productivity. Joint Economics Department and the Directorate for Science, Technology and Innovation Policy Note. Retrieved from http://www.oecd.org/economy/growth/OECD-2015-The-future-of-productivity-book.pdf

Peles C. (1987). Productivity analysis - A case study: Transaction of the American Association of Cost Engineers, 31st Annual Meeting. Atlanta, USA.

Pinder, C. C. (1998). *Work Motivation in Organizational Behaviour*. Prentice Hall, Upper Saddle River, NJ, USA, 1998.

Ritz, G. J. (1994). *Total Construction Project Management.* Boston, United States of America: McGraw-Hill Companies.

Sezer, A. A. (2016). Construction performance measurement: Site managers in refurbishment projects (Doctoral dissertation). Chambers University of Technology, Göteborg, Sweden.

Shehata, M. E., & El-Gohary, K. M. (2011). Towards improving construction labour productivity and projects' performance. *Alexandria Engineering Journal*, *50*(4), 321–330. https://doi.org/10.1016/j.aej.2012.02.001

Shivam, N. (2020). Work Measurement: Definition, Objectives and Techniques Retrieved from https://www.economicsdiscussion.net/engineering-economics/work-measurement-definition-objectives-and-techniques/21707

Siebers, P-O., Aickelin, U., Battisti, G., Celia, H., Clegg, C., Fu, X., De Hoyos, R., Iona, A., Petrescu, A., & Peixoto, A. (2008). Enhancing Productivity: The Role of Management Practices. Advanced Institute of Management Research Paper No. 065, 1–29. https://doi.org/10.2139/ssrn.1309605

Soekiman, A., Pribadi, K. S., Soemardi, B. W., & Wirahadikusumah, R.D. (2011). Factors relating to labour productivity affecting the project schedule performance in Indonesia. *Procedia Engineering*, *14*, 865–873. https://doi.org/10.1016/j.proeng.2011.07.110

Tongoco, D. C. (2007). Purposive Sampling as a Tool for Informant Selection. *Ethnobotany Research & Applications*, *5*, 147–158. https://doi.org/10.17348/era.5.0.147-158

The Institute of Management Services (2020). Work measurement. Retrieved from https://www.ims-productivity.com/page.cfm/content/Work-Measurement/

Tucker, R. L. (1986). Management of Construction Productivity. *Journal of Management in Engineering*, *2*(3), 148–156. https://doi.org/10.1061/(ASCE)9742-597X(1986)2:3(148)

Watkins, M., Mukherjee, A., Onder, N., & Mattila, K. (2009). Using Agent-Based Modelling to Study Construction Labor Productivity as an Emergent Property of Individual and Crew Interactions. *Journal of Construction Engineering and Management*, *135*(7), 657–667. https://doi.org/10.1061/(ASCE)CO.1943-7862.0000022

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