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Assessing Current Practices by Ghanaian Contractors to Improve Productivity

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Abstract

The study sought to establish the determinants of labour productivity of Site operatives in Ghana. Increasingly, there is labour unrest in the construction industry in most developing countries including Ghana, and productivity has become a matter of concern, because there is a demand for higher wages, while the facts on the ground is loss of man hours due to bad management practices and general attitude of workers, and construction also demand intensive labour. The main outcome from the literature is that there is no standard definition of productivity. The study adopted a quantitative design drawn from two previously studied literatures of industrial economics and labour economics. It reports on a survey made on project managers and experienced foremen of building projects in three regional capitals, namely Accra, Kumasi & Tamale. Random stratified sampling was employed to select contractors in the regions for the quantitative study. Whiles survey strategy was adopted in the collection of data. As a result, a questionnaire was developed and administered to project managers of selected construction companies. The PCA extracted four factors namely, quality leadership, communication, motivation and experience supervisors. The analysis revealed that, among 28 critical factors, the 4 extracted factors had great effect on operatives' labour productivity. This has implications for designing managerial strategies for improving labour productivity since the extracted factors are all managerial related factors. Based on the findings, the study has made recommendations for improving the productivity of site operatives in Ghana. Recommendations have also been made for further research.

Keywords: Labour Productivity, Site Operatives, Constructions Management

1.0 INRODUCTION

There is increasingly labour unrest in the construction industry in most third world countries including Ghana. Parallel to labour unrest is low productivity because of loss of man hours due to bad management practices and general attitude of operatives. The efficient utilization of resources, particularly labour, sadly remains one most important measure of management performance (Shehata & El-Gharry, 2011). In construction, productivity is usually taken to mean labour productivity, that is, units of work placed or produced per man-hour. The inverse of labour productivity, man-hours per unit (unit rate), is also commonly used (Shehata & El-Gharry, 2011). Formulating effective plans to increase productivity has remained a priority for the construction industry (Dainty & Loosemore 2013). In this perspective, many research studies have been conducted recently to establish the main determinants of productivity in a wide range of countries (Durdyev & Mbachu 2011; Ghoddousi & Hosseini 2012; Gudienė et al., 2013). Given that there is an association between productivity and wages, it is important that construction project managers and contractors have a fair knowledge of the methods leading to the evaluation of productivity of equipment and labour, in the various crafts (Shehata & El-Gharry, 2011) also, Iyer and Jha (2005), inferred that skills and quality of leadership affects strongly and directly on productivity or performance of construction project. As they bemoaned, "If project managers have strong leadership skills, the project performance can be monitored controlled and managed with high quality".

Studies show a great variety of methods used for measuring productivity in the construction industry. The main resources to manage in the construction industry are labour, material and plant (capital investment). In order to maximize profit and make gains, it is important, as mentioned earlier, to have a controlling hand of the determinants of productivity which contributes to production in general, like labour, equipment, material, cash flow, etc. Literature revealed in Egypt that the second performance criteria, out of 12, by which construction managers would like their performance to be evaluated is "the efficient utilization of resources" (Shehata & El-Gharry, 2011). An effective and efficient management of

construction resources can result in increased productivity and profit, whilst ineffective and inefficient management of these same resources might lead to low productivity and loss of man hours. As stated earlier, young site engineers working in contracting organizations ranked utilization of resources the second out of 12 factors that affect the performance of construction organizations in Egypt (Abdel-Razek, 2004, p. 4; Shehata&El-Gharry,2011). Labour productivity is an important indicator of economic performance. The measures that we choose and how we apply them determine how effectively we manage our resources.

According to McTague *et al.*, (2002); Thomas *et al.*, (2003); Akindele, (2004), they have found labour to account for a third of the total direct capital cost of construction projects. However, only a third to one and a half of worker's time is spent directly on work activities productively (Thomas *et al.,* 2003). The cost of construction labour has risen in recent years since workers always make demand for higher pay and fringed benefits. Improvement in the contribution of labour to productivity is the result of a healthier, better education, better nourished labour force and at times shorter work week (Heizer & Render, 1990). There is enough evidence that suggests that productivity measurements should be the basis for making productivity improvement decisions (Oglesby *et al.,* 1989; McCullouch, 2007; Carlos &Paul,2010). Hence the need for this study, to identify the determinants of labour productivity of operatives in Ghana.

2.0 REVIEW OF LITERATURE

This study draws its literature from two previously separate branches of economics; industrial economics and labour economics. Drawing upon these two distinct sources of economic analysis has important implications for the structure, content and methodological approach adopted for this research. In bringing these two elements together it is possible to achieve a more comprehensive and more fully integrated treatment of determinants of construction labour productivity in a less developed economy like that of Ghana. In terms of constraints and determinants of labour productivity, there are two schools of thought. First, industrial economics has traditionally been more concern with analysis at the level of the individual establishment, firm, market and industry, whereas labour economics has focused primarily upon industry's sectorial relationships within the developmental and effectual use of human resources. Second, it has typically focused upon issues of central concern to mature industrial economics serving large domestic markets; their competitiveness, the transmission of new knowledge into new products and processes, the levels of technical and a locative efficiency that are achieved, this is not the same in labour economics. Labour which (otherwise known as human resources) has widely been recognized as being vital in every organization yet industry have a momentous task in forecasting and planning its manpower requirements which enables the full utilization of these resources. In view of its importance to productivity, there is the need to improve it. However, careful adaptation would be required to implement the knowledge and experience gained in the manufacturing industry to the building construction industry (Alarcon and Borcherding, 1991).

The aspects to be reviewed here include the following sections; section one of the reviewed literatures is about the concept and definition of labour productivity, and section two talks about measurement of productivity. In similar order follows subsequent sections; section three as methods used in productivity measurement, section four is misconceptions about construction productivity, followed by productivity in the construction industry. Then, continued with the impact of motivation, age, technology and unionism on labour productivity. Then, factors affecting construction labour productivity as the seventh section and the eighth section being the constraints to construction labour productivity. And finally ended with a conceptual framework deduced from reviewed literature on construction labour production. Also, the relevant literature reviewed would serve as a framework for the study. It would further be used to support or refute findings made in this research at the analysis stage of this write-up.

2.1 The Concept and Definition of Labour Productivity

The construction industry is seen as one of the most challenging and demanding industry in Ghana and still holds many opportunities for productivity improvement. The term "productivity" expresses the

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relationship between outputs and inputs (Borcherding & Liou, 1986). An increased productivity can at a large have impact on the overall construction process and will result in insignificant cost and time saving (Ghana Trade Union Congress, 2011). Productivity improvement is the main concern for any profit oriented firm, as it represents the effective and efficient translating of resources into marketable product and also determining profitability. Therefore, considerable effort has been directed to understand the productivity concept with different approaches taken by researchers resulting in far reaching variety of definitions of productivity (Ghana Trade Union Congress, 2011). Profitability describes the financial result of business operation. Productivity and price recovery are the major factors affecting profitability. Devis (2007) said at the broadest level, productivity refers to the ability of an industry to convert inputs into outputs. Productivity is a relative concept and when it measures that relates output to only one class of inputs, it is known as partial productivity. For example, labour productivity is measured dividing total output by the amount of labour used in production. It was observed by researchers like Tague and Jergeas (2002) that industry output has grown in line with the broader economy.

Productivity is a relevant concept with comparison either being made across time or between different production units. Productivity is a clear-cut or straightforward concept of a ratio of volume measure of output to a volume measure of inputs used in generating the output. That is to say the amount of output a person is able to generate within a specific time or period. Productivity simply means output per man hour (quantity of bricks laid by a bricklayer within a certain period of time). Prokopenko (1987), said "Productivity is the only important world-wide source for economic growth, social progress and improved standard of living". Productivity can be defined in many ways, but as far back as 1883, Littre gave a definition to productivity as the "faculty to produce," that is, the desire to produce (Jarkas, 2005). According to Jorgenson, Gollop and Fraumeni (1987), there are many definitions to productivity. Here, we restrict our interest to labour productivity as a direct measure of industrialization. The Organization for European Economic Cooperation (OEEC) in 1950, introduced the definition of productivity as a quotient obtained by dividing the output by one of the production factors (Sumanth, 1984).

Drewin (1982) said in his studies the definition of labour productivity is the amount of goods and services produced by a productive factor (manpower) in the unit of time. The most used definition is that of Borcherding and Liou (1986), as a ratio between an output value and an input value used to produce the output. This output consists of products or services, and the input consists of materials, labour, energy, etc. Productivity is defined in many ways. Yet in construction, productivity is taken to mean labour productivity. Meaning units of work placed or produced per man-hour. The inverse of labour productivity, man-hours per unit (unit rate), is also usually used. Productivity is the ratio of output to all or some of the resources used to construct the object (output). Resources consist of labour, capital, energy, raw materials, etc.

Productivity is the "relationship between output generated by a production process or service system and the input provided to create this output". It is a measure of output from a production process or a service system per unit of input. Productivity is the ratio of output to all or some of the resources used to produce that output. Output can be homogenous or heterogeneous. Productivity can be looked at as a ratio that tells us how well a company (individual or a country) is doing in terms of converting resources (labour, materials, machines etc.) into goods and services. In plain words, or in a clearer way, productivity refers to an economy's ability to turn inputs into outputs. Mathematically, productivity is defined as the ratio of output to input or an output-input ratio. Generally, an operational definition of productivity that fit well with the various approaches to define the concept (which draws upon the output-input paradigm) as the amount or quantity of output of the process to unit of resources put-in". This is in line with similar definitions given by a several number of researches (Ghana Trade Union Congress, 2011; Tran and Tookey, 2011; Page 2010; Enshassi *et al.*, 2007). Each measure of productivity is a ratio of output and input. However, the summary of the first Equation have all the key features embodied in this definitions;

$$\text{Productivity} = \frac{\textbf{Output}}{\textbf{Input}}. \qquad \text{(Eq.1a)}$$

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Where Input refers to production factors such as labour, capital, raw materials, and information used in the process of production and Output refers to the product or service created. The output may be in the form of goods or services and it may be either for immediate use or an intermediate input for another production or service system.

$$\text{Productivity} = \frac{\text{Output}}{\text{Labourcost}} \qquad \text{(Eq.1b)}$$

In the above formula, labour cost means all inputs. This is quality added to the quantity of work done. That is to say that a high output-input ratio implies higher productivity. The reverse is also true, that is a low ratio implies lower or dwindling productivity. Higher productivity therefore means the ability of a labour force to achieve more in terms of quantity or quality of work done (output) with fewer or same labour cost or amount of resources (inputs). The productivity ratio, however, does not on its own measure how efficient and effective the conversion of resources (inputs) into output takes place. The basic notion of productivity is that it is the relationship between the quantity and quality of what is done (output) and the amount of resources, human or material, used in doing so. A productive system is one that produced more output, in terms of quantity and quality with the same or smaller amount of inputs.

Horner and Talhouni (1998) stated, "A popular concept in the USA, and increasingly in the UK, is the concept of earned hours. It relies on the establishment of a set of standard outputs or "norms" for each unit of operation. Thus, a number of earned hours are associated with each unit of work completed. Productivity may then be defined as the ratio of earned to actual hours. The problem with this concept is in establishing reliable "norms", for setting standards. It also depends on the method used to measure productivity, and on the extent to which account is taken of all the factors which affect it. On a construction site, contractors usually pay a lot of attention to labour productivity, and it can be defined in one of the following was;

$$\text{Labour Productivity} = \frac{\text{Output}}{\text{Labourcost}} \qquad \text{(Eq. 2a)}$$

or

$$\text{Labour Productivity} = \frac{\text{Output}}{\text{Workhour}} \qquad \text{(Eq. 2b)}$$

There is no standard definition of productivity, and some contractors use the inverse of the above;

$$\text{Labour Productivity} = \frac{\text{Labourcost/ Workhour}}{\text{output}}. \qquad \text{(Eq. 3)}$$

Productivity is a relative concept which makes for comparisons either across time or between different production units and sectors. For example, producing more output this year with the same amount of resources or inputs that were used last year means that productivity has improved or there have been productivity gains amid the two periods. And that is to say, productivity is higher in this year compared to last year. Also that signifies how well an individual entity uses its capital or resources to produce outputs from inputs. Going a little further of this general notion or norm, a critical observation of productivity literature revealed various applications which mean there is neither a consensus as to the meaning nor a universally accepted measure of productivity. To make a venture at measuring productivity would be based on the individual, the firm, selected industrial sectors, and even entire economies. Debatably, it appears as the choice of appropriate measurement method increase with complexity.

This study of determinants of labour productivity of site operatives is a contextual one, pertaining to Ghana and maybe might be suitable for Sub-Sahara African countries like Senegal, Gambia, Mali Niger, Benin, Cameroun, etc. Due to the contextual nature of the study, the researcher is considering Ghana as a developing country and for that matter, has adopted the simplest definition of labour productivity by

previous research (Borcherding and Liou, 1986) and modernized it for the study. Construction labour productivity according to the current researcher is defined as, "the quantity of activity carried out by operatives per unit time" or "the ratio of the quantity of work carried out to the time taken." To further explain or give more flesh to the definition, if a metre square (m^2) area of blockwork is laid by a mason that is the output, within a specific time (the input).

2.2 Measurement of Productivity

Productivity is equals to value divided by time (Pavlina, 2005). Productivity = Value/Time

According to this formula there are two possible ways to maximize the productivity. To either maximize the Value or/and Minimize the time. In order to complicate the situation one can add other factors like energy and resources but making simplicity of time in most cases factors like energy and resources are considered as reducible to time factor approximately. Optimization of time factor that incurred for any venture will bring the least time counter (Pavlina, 2005). Accordingly, time consumed for realization of activity concerned is less and it is definite to give high productivity yield. Pavlina (2005) also argues that "value" fraction of the productivity equation can be appropriated to the "quality". Productivity concept in business ventures is not a new theory. It goes as far back as more than five decades. As per the definition made by European Productivity Agency (1959) "Productivity is a state of mind, an attitude that seeks the continuous improvement of what exists. It is a conviction that once one can do better today than yesterday and that tomorrow will be better than today". It also outlined that applying the simplest mathematical concepts, productivity can be improved by a larger increase of output against a smaller increase in input or it can be improved by increasing output and reducing input which is a real challenge for any industry. Productivity is a ratio of volume measure of output to a volume measure of inputs used in generating the output.

However, productivity literature shows that while there are virtually no disagreements over the concept there is no such agreement over how it is measured. This has given rise to multiplicity of measurements and measurement indicators (Ghana Trade Union Congress, 2011a). The varied measurement indicators also show that there is no consensus on the purpose of productivity. Therefore, depending on the objectives one has in mind in measuring productivity one might agree to one measurement indicator or the other (Ghana Trade Union Congress, 2011b). There are different reasons why firms, industries and countries go to great lengths to develop productivity indicators and proceed to measure the level of those indicators. Policymakers (governmental agencies, commerce and congress) are interested in productivity measurement for several reasons. These include but not limited to technological change, efficiency, benchmarking production units, cost saving, and they provide indicators for assessing the overall living standards of the people (Ghana Trade Union Congress, 2011c).

As said earlier, different measures of productivity serve different purposes. As suggested by Thomas, Maloney, Malcolm, Horner, Smith, Handa and Sanders (1990), it is important to choose a measure that is appropriate to the purpose. Thomas *et al.,* (1990), defined different aspects of measures as follows:

Total factor productivity (TFP)

$$=\frac{\text{Totaloutput}}{\text{Labour+Materials+Equipment+Energy+Capital}} \qquad \text{(Eq.4a)}$$

or

$$=\frac{\text{Dollars/Cedisofoutput}}{\text{Dollars/Cedisofinput}}, \quad \text{better still} \qquad \text{(Eq.4b)}$$

3.0 RESEARCH METHODOLOGY

This study employed a quantitative approach. This was seen as appropriate in view of one of the study's research questions which seeks to find out the current practices use by contractors to improve productivity and to find out the factors that correlate labour productivity of operatives in the Ghanaian

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construction industry. The strength of the quantitative approach is that the research findings come from quantifiable data that are usually generalize-able to a larger population (Neuman, 2006).

3.1 Population

The population for the study is made up of a targeted group within construction companies namely; site Supervisors or site managers. General site foremen and headmen in construction firms of all categories belonging to the Association of Building and Civil Engineering Contractors of Ghana (ABCECG). According to Association of Building and Civil Engineering Contractors of Ghana, they hold a total membership of 1500 contractors in the country (ABCECG, 2013). The following figures were given by ABCECG for the regions; Greater Accra region- 127 contractors, Ashanti region - 48 contractors and Northern region-62 contractors. These three regions host many of the reputable construction companies operating in the country. The major cities in these regions are their administrative capital cities, and for that matter, Tamale has been chosen for Northern region, Kumasi for Ashanti region and Accra for the Greater Accra region.

Even though there are other mainstream associations of construction firms in Ghana, the firms in this association (ABCECG) is selected for the study because of its outstanding track record proven over the years and the international recognition it has attained. Secondly, it comprises of both building and civil engineering contractors. Thirdly, it covers both large and small scale contractors (D1, D2, D3 and D4 for general building contractors, K1, K2, K3 and K4 for civil engineering contractors).

Classification of construction firms in Ghana is done by the Ministry of Water Resources, Works and Housing (MWRWH). The D1, D2 and K1, K2 categories are classified as large scale firms and D3, D4 and K3, K4 are classified as the small scale contractors. According to the ministry's classification, the large scale contractors both civil and general building contractors are in the highest financial class. Though the small scale firms employ a large number of workers because small firm are spread throughout the length and breadth of the country, the large firms have relatively more organized managed labour force, and undertake large volumes of works.

The selection of data source is relevant for an academic research of this kind, instead of taking the list of up-to-date firms from the Ministry of Water Resources, Works and Housing, the researcher sort to use the list of firms from an association (ABCECG). In fact, Ministry of Water Resources, Works and Housing annual contract registration is not the most reliable data source available at present in Ghana. Simply because most construction companies are defaulting and not up-to-date in business because of competition, political affiliation, scarcity of contract and liquidity problems or for one reason or the other, they are not being able to renew their registration at the ministry. Secondly, a construction firm needs to register with the ministry to be qualified to bid for public works. When one is not registered, one can only bid for private jobs. These and many more make records of construction companies by the Ministry of Water Resources, Works and Housing incomplete.

3.2 Sampling Technique

The stratified random sampling and snow ball sampling was employed. Snow ball was used in the northern region because the researcher was not familiar with the terrain and have to fall on others for direction to construction sites. In fact, sample should represent all the properties of the population without any doubt. The main intention of stratified random sampling techniques was to collect representative samples from contractors in the two regions randomly. A suitable sampling technique is required to limit the study to a relatively small portion of the population.

3.3 Determination of Sample Size

The more accurately we expect the data to reflect the total population, the larger will be the sample size and more reliable and valid the results based on it will become (Bouma and Atkinson, 1995. Pp. 152-153). The total number of construction firms to be included in the study would be determined by the Kish equation; Kish (1965). Assaf *et al.,* (1999, 2001), Abdul-Hadi (1999) and Enshassi (2010), among others used this equation:

$$n = \frac{n'}{\left\{1+\left(\frac{n'}{N}\right)\right\}}$$ Where

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n = Sample Size from finite population
N = Total Population
n´ = Sample Size from infinite population calculated from; $n' = S^2 / V^2$,

Where V = Standard error of sample population equal to 0.05 for the confidence level 95%, t = 1.96
S^2 = Standard error variance of population elements,
S^2 = P (1 - P); Maximum at P = 0.5.

The sample size of the contractors can be calculated from the afore mentioned equations as follows;

$n' = \frac{S^2}{V^2}$ =
S^2= P (1- P)
S^2= 0.5 (1- 0.5)
S^2= 0.5×0.5
S^2= P (1-P)
Where P = 0.5
S^2= 0.5 (1- 0.5)
S^2= 0.75

To find V^2, let V =0.05 level of confidence.

V^2= $(0.05)^2$
V^2= 0.0025
$\therefore n'$= $\frac{S^2}{V^2}$ = $\frac{0.75}{0.0025}$
n'= 300 answer
n contractors in Accra = $\frac{300}{\left\{1+\left(\frac{300}{127}\right)\right\}}$ = 90 contractors
n contractors in Kumasi = $\frac{300}{\left\{1+\left(\frac{300}{48}\right)\right\}}$ =42 contractors
n contractors in Tamale = $\frac{300}{\left\{1+\left(\frac{300}{62}\right)\right\}}$ = 52 contractors

Assuming a non-response rate of 40%, a total of 1.4 x 184 will be required to be distributed. That is a total of 257 questionnaires will be required to be distributed. Presumably 40% non-response rate will do for unreturned or unanswered questionnaire, and all wasted questionnaires. The total questionnaires to be distributed in each of the three selected regions is summarized in Table 3.1.

Table 3.1 Number of questionnaires to be administered in the selected region

REGION	Greater Accra	Ashanti	Northern	Total
Number of questionnaires to be administered.	115	66	76	257

3.4 Data Collection and Procedure: The following instrument was used to collect data for the research:

Questionnaire: Structured questionnaires would be used to gather data for analysis. The questionnaires would be devised through the literature review having in mind the nature and character of the population. It would also be essential to provide straightforward questions to respondents to ensure a clear understanding of all the applicable definitions, procedures, strategies and guiding principles that would be used to collect the data. In order to enhance the study, after the literature review, a plan would be formulated for collecting field information and creating an evaluation process and numerical values.

3.4.1 Questionnaire

Questionnaires are used for the gathering of data. The questionnaires are prepared for the site supervisors of the Contractors who are members of Association Building and Civil Engineering

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Contractors of Ghana. As earlier mentioned, the questions are such that they contain elements to ravel labour related issues that impede productivity and profit.

3.4.2 Pilot-Test of Questionnaires

A pilot-test of survey questionnaire of an industry-wide research of this calibre is deemed important. The pilot-test is conducted to obtain feedback from practitioners in the industry. The pilot-test served largely to; 1) test the relevance of the constructs in Ghanaian construction context, 2) identify further constructs not captured from the secondary source (literature review), 3) to test the clarity and relevance of the questions, 4) modify the look and feel of the questionnaires and 5) to explore ways of improving the questionnaires appeal and response rate. The questionnaires were pre-tested by ten Mphil. Construction students. Response revealed the need to improve the clarity of a few questions. Part of the feedback received from the pre-test was the need to add "Uncertain" or "No idea" to the four-point rating system to five-point rating scale. This was to avoid any guesses from the participants who might not be clear about the question or not having the background knowledge of some particular constraints.

3.4.3 Validity and Reliability

This part presents tests of reliability of questionnaire according to the pilot study.One of the most commonly used indicators of internal consistency is Cronbach's alpha coefficient. According to Hair et al. (2010) and Straubs et al. (2004), the Cronbach alpha coefficient of a scale should be 0.7 or above. In the current study, the Cronbach alpha coefficient was0.978, indicating that the research instrument has high reliability, graded excellent. The reliability of an instrument is the level of consistency which measures the attribute it is supposed to be measuring (Polit& Hunger,1985). The less variation an instrument produces in repeated measurements of an attribute, the higher its reliability. Reliability can be equated with the stability, consistency, or dependability of a measuring instrument. The test is repeated to the same sample of people on two times and then compares the scores obtained by computing a reliability coefficient (Polit& Hunger, 1985). Chronbach's coefficient alpha (George and Mallery, 2003) is designed as a measure ofinternal consistency, and asked, do all items within the instrument measure the same thing? The normal range of Chronbach's coefficient alpha value between0.0 and + 1.0. The closer the Alpha to 1, the greater the internal consistency of items in the instrument being assumed. As the number of items (variables) in the scale increases, the value□□becomes large. Also, if the inter correlation between items is large, the corresponding □will also be large. Since the alpha value is inflated by a large number of variables then there is no set interpretation as to what is an acceptable alpha value.

The Chronbach's coefficient alpha was calculated for each field of the questionnaire. The most identical values of alpha indicate that the mean and variances in the original scales do not differ much, and thus standardization does not make a great difference in alpha. Table 3.2 shows the values of Chronbach's Alpha for each filed of the questionnaire and the entire questionnaire. For the fields, values of Chronbach's Alpha were in the range from 0.707 and 0.879. This range is considered high; the result ensures the reliability of each field of the questionnaire. Cronbach's Coefficient Alpha reliability estimate for the 93 labour productivity items was 0.978. Chronbach's Alpha value shows an excellent reliability of the entire questionnaire. In so doing, it can be said that the questionnaire is valid, reliable, and ready for distribution for the population sample.

Table 3.2 Chronbach's Alpha for each filed of the questionnaire

S/N	Field	No. of items	Cronbach's Alpha
1.	Managerial related factors	24	0 .943
2.	Technical/ Technological factors	12	0 .861
3.	Labour Union related factors	12	0.831
4.	Biographical variables factors	15	0.895
5.	External related factors	12	0.905
6.	Productivity	4	0.859

7.	Constraints	6	0.859
8.	Practices/Measures	8	0 .871
	Total	93	0 .978

3.4.4 Scale and Rating of Responses

The results were determined using mean value data based on the following rating scale: (1=Strongly Disagree, 2=Disagree 3=Uncertain/ No idea, 4=Agree, 5=Strongly Agree). Mean is a technique to compute the strength of index familiarity, frequencies and agreements of specific question. The data collected were analyzed using mean index which is used specifically for the ordinal scale measurement. The mean index can be computed by using the SPSS.

All the key Determinants/factors related to operatives' productivity in construction were calculated and arranged based on the indication of mean response in the descending order and whichever values indicating near to one (1) will be considered as the highest entry modes decision of mean response. The mean response for mean value was allocated with the rating of 1.00 to 1.50 for strongly disagree, 1.50 to 2.50 for disagree, 2.50 to 3.50 for uncertain or no idea, 3.50 to 4.50 for agree and 4.50 to 5.00 as strongly agree.

3.4.5 Principal Component Analysis

The researcher intended use of the PCA is for the purpose of reducing the data to a bearable few for clearer presentation of results. This method is mostly used as a tool in exploratory data analysis and for making predictive models. Principal component analysis is closely related to factor analysis, and the factor analysis is a technique used to condense the information in a large number of variables into a smaller set of new, composite dimensions known as factors (Hair et al., 2011). Factor analysis typically incorporates more domain specific assumptions about the underlying structure and solves eigenvectors of a slightly different matrix. Principal component analysis can be done by eigenvalue decomposition of a data correlation matrix usually after mean centring the data matrix for each attribute. The results of a PCA are usually discussed in terms of component scores, sometimes called factor scores (the transformed variable values corresponding to a particular data point), and loadings (the weight by which each standardized original variable should be multiplied to get the component score).

In order to test for the appropriateness of using the PCA for the data, two tests were conducted, Kaiser- Meyer- Olkin (KMO) and Bartlett's test of sphericity. The KMO measure of sampling adequacy compares magnitudes of correlation coefficients to the magnitude of partial correlation coefficients (Malhotra and Dash, 2011). The value of KMO ranges from 0 to 1 and a minimum value of 0.5 is specified as an acceptable threshold for proceeding with factor analysis (Hair et al., 2011; Malhotra and Dash, 2011). The rotated component matrix is presented in Table 3.3. In the preliminary analysis, the Kaiser-Meyer-Olkin (KMO) test of sampling adequacy achieved a high of 0.938. The communalities achieved were also 0.80 or higher, indicating that the sampling size was reasonable enough for the factor analysis to proceed. In order to test for the appropriateness of using the PCA for the data, two tests were conducted, Kaiser-Meyer- Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity

In the present research, the KMO measure of sampling adequacy is 0.886 which is well above the acceptable value of 0.5 and is interpreted as 'meritorious'(Hair et al.,2011). The Bartlett's test of sphericity tests the factors that the correlation matrix is an identity matrix, which implies that the variables are uncorrelated (Chan et al., 2012; Field, 2005; Malhotra and Dash, 2011). The value associated with Bartlett's test of sphericity was large (approximate chi-square statistic=5.192E3) and the Bartlett's test is significant (p=.000), therefore factor analysis is appropriate (see Table 3.3).

Table 3.3: KMO and Bartlett's Test

KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.886
Bartlett's Test of Sphericity Approx. Chi-Square	5.192E3

Df	378
Sig.	.000

3.4.6 Correlation matrix

There was perfect positive correlative between the factors. The matrix shows perfect relationship, with r= +1 or a perfect negative relationship, with an r= -1 between any two aspects of the factors. Hence many of the factors have relationships such that motivation and skills are highly correlated at 0.797, with the exception of the 'job security' (see Table 4.18), which had low correlation of 0.184 with other factors especially 'nutrition and physique,' hence it was not included in the analysis.

The SPSS tool used advices that, any factor that correlates highly (for example r >0.8) should be eliminated from the investigation. A careful study reveals that there is none of the factors gone beyond 0.8, making a greater number of the factors moderately and highly correlated. Both tests used indicated factor analysis to be an appropriate technique for the present research. The variable 'job security' had very low correlation (.184) with the other variables especially 'nutrition' and hence was not included in the analysis

4.0 DATA ANALYSIS

4.1 Practices and Measures Companies put in to enhance Labour Productivity.

Table 4.9 shows level of agreement in a descending order for the measures and practices put in place by respondents' companies to enhance labour productivity in construction. Analysis shows that all respondents agreed with the measures listed. Provisions of sick leave with pay, health insurance and retirement benefit for employees at the mean value of 4.5000. It is the most important measure that would influence labour productivity of operatives in the construction industry. Provision of these will make the labour work less stressful, relieving one of thinking about one's own welfare and retirement. Similarly, majority of respondents strongly agreed agree that management bearing full cost of treatment of injuries sustained at workplace at the mean value of 4.4667.

Another measure that scored much was height allowance for working on higher structures at certain heights, they strongly agreed at mean value of 4.4500, and followed by respondents strongly agreeing to schedule overtime in order to finish work by planned schedule at the mean value of 4.4000.The fifth variable respondents strongly agree to was' information provided to both employees and management on the achievement and progress', at mean value of 4.2833.Which was followed by inappropriate human relations could lead to withdrawal of goodwill by employees at the mean value of4.2500. Long service award for the recognition of employees' long-term commitment to organization would enhance the operative's productivity was seventh in ranking at the mean value of 4.1500. The last but not the least of the measures was tools allowance to be paid to employees. See Table 4.9.

Table 4.9 Descriptive Statistics of Practices and Measures Adopt to Enhance Productivity.

Variable	N	Min	Max	Mean	Std. Dv.
Provision of sick leave with pay, health insurance, retirement benefits for employees.	180	2.00	5.00	4.5000	.74369
Management bearing full cost of treatment of injuries sustained at work place.	180	2.00	5.00	4.4667	.72002
Height allowance (for working on higher structures at certain heights).	180	1.00	5.00	4.4500	.86699
Schedule overtime (in order to finish work by planed schedule).	180	2.00	5.00	4.4000	.73690

Information is provided to both employees and management on the achievement and progress.	180	2.00	5.00	4.2833	.73443
Inappropriate human relations could lead to withdrawal of goodwill by employees.	180	1.00	5.00	4.2500	.97954
Long service award (recognition of employees' long-term commitment to organization).	180	1.00	5.00	4.1500	.99986
Tools allowance is paid to employees.	180	1.00	5.00	3.9833	1.15054
Valid N (listwise)	180				

5.0 CONCLUSION

The sustainability and success of a construction firm today, depends more and more on the diverse practices and measures adopted by management of the companies. The management of the 21st century firms should focus on innovative and skilled labour-force, employees' satisfaction, development and well-being of workers, workmen compensation, career progression and related work practices should enable employees and the organization to achieve high performance.

The first research objective of this study was to assess current practices by Ghanaian contractors to improve productivity. During the data gathering processes, research participants' responses provided valuable measures to mitigate identified determinants that influence labour productivity. And Table 4.9 shows level of agreement in a descending order for the measures put in place by respondents' companies to enhance labour productivity in construction industry. Analysis shows that respondents agreed with all the measures listed.

Table 4.9, indicates that, provision of sick leave with pay, health insurance and retirement benefits for employees came at the mean value of 4.5000. These results are consistent with Lazear (1979)'s theory of deferred compensation, which assumes that workers and firms want to be engaged in long term relationships and concludes that rising earnings do not necessarily fully reflect increased productivity. But this current finding contradicts with what (Prendergast 1993) said, he considered the role of promotions in inducing firm specific skills. Provision of sick leave with pay, health insurance and retirement benefits for employees is the most important measure that would influence labour productivity of operatives in the construction industry. Provision of these will make the labour work less stressful, relieving one of thinking about one's own welfare and retirement. Similarly, majority of respondents strongly agree at the mean value of 4.4667 in the second rank that management bearing the full cost of treatment of injuries sustained at workplace, would boost productivity. This result is in agreement with the findings of Fabling and Grimes (2008); the authors examine the relative importance of internal/ controllable and external/uncontrollable constraints to firm's performance and conclude that the differences in firm performance are explained in large measure by factors over which they have control rather than purely by exogenous factors.

Another measure that scored much at the third rank was height allowance for operatives working on higher structures at certain heights, they strongly agreed at mean value of 4.4500, because working at higher levels is a risk taking venture. Of the 1,121 workplace fatalities in 2002, approximately 20% of them occurred in construction-related accidents (BLS 2002). Construction labourers ranked ninth among the most dangerous occupations,

The respondents strongly agreeing at the fourth rank with a mean value of 4.4000 to schedule overtime in order to finish work by planned schedule. That is to say operatives agree that working time could be extended in order to finish work on schedule, but it should go with the due allowances. The fifth variable respondents strongly agree to be information provided to both employees and management on the achievements and progress, at mean value of 4.2833.

This result is consistent with the findings of the Building and Construction Sector Task Force (DBH, 2009) notes that better management of the boom-bust cycle will help improve skill development and retention, reduce waste and give greater confidence to industry participants. Which was followed by inappropriate human relations, could lead to withdrawal of goodwill by employees at the mean value of 4.2500. Operatives solely wanted management to recognize their existence and respect because without them work will come to stand still.

Long service award for the recognition of employees' long-term commitment to organization would enhance the operative's productivity was seventh in ranking at the mean value of 4.1500. Social and welfare issues are one of operative's challenges, for higher productivity this issues should be given serious attention. The last but not the list of the measures was tools allowance to be paid to employees, see Table 4.9. The low response to this is an indication that workers sometimes do not know what they are entitled for.

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