Civil and Environmental Research
ISSN 2224-5790 (Paper) ISSN 2225-0514 (Online)
Vol.6, No.4, 2014

An Analysis of Relationship between Working Height and Productivity of Masonry Workers on Site

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Abstract
The analysed the relationship between working height and productivity of masonry worker on construction site by investigating two project sites. Data were also gathered by observing work activity on site. Time study form was design to record the various elements of the task performed and the time taken to complete each element over a period of observation at both floor levels for a period of six working days. A total of thirty structured questionnaires were administered on the factors affecting workers productivity on construction site. T-test was used to determine the difference between productivity at different level. The research concluded that the factors affecting\workers productivity are: Availability of materials, Weather, Gang size, Enabling environment, Height of work have strongly significant effect on the productivity of workers output on construction sites. A none statistically significant difference existed between the output of block laying at both floor levels but a statistically significant difference existed between the output of concrete work at first suspended floor slab and second suspended floor slab. It was also concluded that the output determined for Block laying was $12m^2$/day, Concrete work $19m^2$ /day and$16m^2$ /day at 1st suspended and 2nd suspended floors respectively. It was recommended that the result of this research should be used to provide information upon which planning, scheduling and cost control of block laying, plastering and concrete works can be carried out.
Keywords: Construction Productivity, Work study, working height & Masonry productivity

1.0 Introduction

Productivity being a major concern to production and operation managers, higher productivity can be achieved through better utilization of available resources. Encyclopaedia (2010) asserted that productivity is often used as a measure of, index of growth, measure of efficiency and wages and price analysis. An overall rise in a nation's labour productivity signifies the availability of a larger quantity of goods and services per worker than before and accordingly, a potential for a higher real income per worker. Countries with high labour productivity are usually those with high real wages, while those generally with low in productivity are those with low real wages (Alinaitive, Mwakali and Hansson, 2007)

Olomolaiye and Ogunlana (1989) noted that the production outputs in key building trades in Nigeria were lower than they ought to be. The inefficient method, lack of appropriate tools and poor supervision and training were advanced as reasons for the low productivity of Nigerian workers. Thomas (1991) stated that the factors undermining on the productivity of construction workers are as follows.

Type, scope, layout and complexity; Time frame (percentage complete); Construction methods; Weather ;Skill of the work force; Work practice; Length of work day ;Availability of materials; Incentives ;Degree of supervision ; Enabling environment; Government regulations and organization size and maturity.

A study carried out by Alinaitive, Mwakali and Hansson (2007) ranked incompetent supervision and lack of skills of the workers as the two most significant causes of low productivity of construction workers in developing countries. Similarly, Odusami and Unoma (2011) noted that the problems of low productivity can be directly linked to poor and inadequate training of construction skilled workers. Previous studies have identified various factors that affect labour productivity on construction sites. Therefore, this research aim was to find out the most significant factors affecting the productivity of a construction worker on a site and productivity of a qualified skilled masonry worker at selected level per day, to analyse the relationship between working height and the productivity of masonry worker on a construction site.

Moselhi (2010) opined that the number of factors that impart labour productivity on daily bases includes; Temperature, relative humidity, wind speed, precipitation, gang size, crew composition, height of work, type of work and construction method employed.

Productivity can be defined as a ratio of the production output volume to the input volume of resources. Since both output and input can be quantified in a number of days, there is no simple measure of productivity that is universally applicable, particularly in the construction industry, where the products are often unique and there is no standard for specifying the levels, for aggregate of data (Hendrickson, 2003).

The aim of the research is to analyse the relationship between working height and Productivity of masonry worker on construction site, the aim was achieved through the following objectives; To identify the most

significant factors undermining productivity of construction worker on site and to carryout productivity measurement of a gang of masonry worker's output per day at both ground and first floor levels

2.0 Masonry workers Productivity factors

Under piece work rates/productivity scheme, the worker's earning is tied to his output. Thus irrespective of the number of hours spent on a particular task; his earning will be computed based on the number of units completed. Quite often we heard that an average mason is expected to lay a hundred (100) sandcrete blocks per day. There are a few problems associated with this system; it is conceivable that the worker could consider his need and work for only that much.

Khanna (2007) Observed that working height and environment affect the masonry worker's output due to the method of transporting of materials, the distance, type of unskilled labour, scaffolding, position of materials, access to the working places as the work proceeds and obstructions frequently leads to delay, wastage and generally inconvenience. Work is affected not only by the method at which it is performed but also in the environment in which it is performed.

The purpose of work study is the provision of factual data to assist management in making decisions and to enable them to utilize with the maximum of efficiency all available resources (that is labour, plant, materials, and management) by applying systematic approach to problems instead of using intuitive guess work (Oxley and Poskitt, 2007).

Work study has two main aspects, method study and work measurement which are very closely related. For convenience they will be considered separate in this text, but their interdependence must be appreciated at all times.

According to Khanna (2007) work study involves observing the worker at work. The methods used by the worker are observed and recorded in a work measurement study; the time taken by the worker to carry out an operation is recorded. Those observations have a behavioural impact on the worker.

The tables below show the extracts of masonry worker's productivity average outputs in Nigeria from established building and price books.

Table 1a. Construction workers average output in Nigeria

Concrete work	**Output per 8hr/day**
Concretor	
1. Hand mixing and placing of concrete to a height not exceeding 3.0m above ground level	0.5m/day (Unskilled)
2. Machine mixing and placing of concrete to a Height not exceeding 3.00 ground level	0.6m/day (Unskilled)
3. Spreading and tampering of concrete in columns and walls, beams	10Cu.m/day (unskilled)
4. Spreading and tampering of concrete in floor roof or slabs	80.00sq m/day
Blockwork	
1. Laying 100mm block wall (1 No Mason + 1 No labour)	8.00sq.m/day (Gang
2. Laying 150mm block wall (1 No Mason + 1 No labour)	8.00sq.m/day (Gang)
3. Laying 230mm block wall (1 No Mason + 1 No labour)	7.00sq.m/day (Gang)
4. Laying pre-cast concrete screen wall (1 Mason + 1 labour)	10.00sq.m/day(Gang)
5. Laying clay block screen wall (1 No Mason + 1 No labour)	12.00sq.m/day(Gang)
6 laying glass block wall (1 No Mason + 1 No labour)	10.00sq.m/day(Gang)

Source: Consol's Nigeria Building Price Book (2010) Fourth Edition.

Table 1b. Construction workers average output in Nigeria

Finishing	Output per 8hr/day
1. Plastering wall	18.00sq.m/day (Skilled)
2. Plastering ceiling soffit not exceeding 3.5m high	10.00sq.m/day (Skilled)
3. Plastering 4 sided columns 600-1000mm girth n.e. 3.50m h	6.00metre/day (Skilled)
4. Plastering 3 sided beams not exceeding 3.50m high	6.00metre/day (Skilled)
5.Screeding of floor 50mm thick	25sq.m/day (Skilled)
6. Floor tiling with screed bed 300mmx 300mm	10sq.m/day (Skilled)
7. Wall tiling with 300mm x 300mm	8sq.m/day (Skilled)
8. Building in and dressing of single door frame	2No./day (Skilled
9. Building in and dressing of double door frame	1No /day (Skilled)
10. Building in and dressing of window from, 1200mm x 120mm	2. No/day (Skilled)
11. Building in and dressing of window frame 1800mm x 1200mm	1 No/day (skilled)

Source: Consol's Nigeria Building Price Book, 2010 (Fourth Edition)

2.1 Time study

This is a technique for recording the time and rates of working for the elements of a specified job carried out under specific conditions, for analysing the data so as to determine the time necessary for carrying out the job at a defined level of performance. This technique involves observing a competent operative working at a specified activity. Each stage of element of the activity needs to be recorded, timed and rated. The aim is to establish the time for doing the activity at a defined rate under specific condition (Khanna, 2007).

2.2 Method of timing.

Timing and rating are obviously carried out in the field, and the methods of timing commonly used in the construction industry are cumulative timing and fly back timing.

a. Cumulative Timing: is the more common as it is better for observing a number of operatives in a gang and requires only an accurate wrist watch. The cumulative time is recorded after each element.
b. Fly back timing: is carried out with a fly back stop watch, the observer recording the time for each element of work proceeds. The watch has a fly back button on it that returns the hands to zero when pressed; on releasing the button the watch recommences timing. To check the accuracy, the start and finish times are taken, and the difference between them is compared with the total of the readings.

Table 2. Time study for Bricklaying operation

Element	Rating	Cumulative time	Observed time	Basic time	Allowances	Standard time
Discharge of material	85	0.27	0.27	0.23	28	0.30
mixing mortar	75	2.30	2.03	1.52	34	2.05
laying brick work	100	2.85	0.55	0.55	30	0.72
pointing brick work	90	5.12	2.27	2.05	33	2.73
					Standard time (in minutes)	5.80

Source: Construction management Finance Measurement, 1997

3.0 Research Methodology

The data used for this research were gotten from the case study area of Federal University of Technology, Minna, Gidan Kwano main campus. The construction sites are School of Environmental Technology (S.E.T.) Phase II complex and the construction site for School of information and communication Technology (S.I.C.T.) Phase I and II construction projects. The two projects are two storey buildings comprised of offices and lecture halls and were constructed at the same time. The research is limited to only one storey building at two different construction sites.

The qualitative aspect of the research involved the use of questionnaire to obtain information on factors affecting workers productivity on construction site from the operatives on the sites. The questionnaire were analysed by using Likert's scale of five (5) point weights rating scale, ranging from strongly significant (5) to strongly not significant (1) to measure the opinion on the factors affecting labour productivity on site (Morenikeji, 2006). A total of thirty (30) questionnaires were self administered, fifteen (15) each to the two project sites. The operatives that can neither read nor write were assisted by the site manager in interpreting the question and filling of the questionnaire.

The second sets of data were gathered by observing work activity on site with the support of research assistant. Time study form was design to record the various elements of the task performed and the time taken to complete each element over a period of observation at ground floor level and first floor level for each day at the two construction sites under study. A wrist watch and stop watch were used to record the time observed for each operations per gang in a working day for laying blocks and casting concrete in ground and first floor levels. The data were collected daily for six (6) days for each of the three activities at the two construction sites. The observed time recorded for each element is an average of twenty 20 cycles of observation in respect of each operatives (i.e. gang selected for effective monitoring). A total of 5,280 observations were made on the two sites using time study fundamentals instruments that is a wrist watch and stop watch. Data which were not measured were obtained from the project managers and were incorporated into the time study form, such information as observed are: rating on site, crew composition, mixer output per skip/ batch percentage of rest allowance for each elements.

Basic time $= \frac{\text{observed rating x observed time}}{\text{standard rating (100)}}$

Standard time $= \frac{\text{basic time x observed rating+allowance}}{\text{standard rating}}$

Students T- test decision rule

The decision rule adopted for this research study are given below.

For positive T Cal: If T Cal > T tab ==significant and If T Cal < T tab==not significant

For negative T Cal: If T Cal < T tab== not significant and If T Cal > T tab== significant.

Decision rule for the likert scal
1-1.50 = Strongly not significant
2.51 -3.50 = Undecided
1.50 -2.50 =Not significant
3.51 – 4.50 =Significant
4.50 = Strongly Significant (Morenikeji, 2006)

4.0 Results and Discussion

Table 3. Rating of factors affecting productivity of construction workers.

S/no	Factors affecting productivity	Sum	Mean (sum/30)	Weights Rating scale
1	Availability of material	142	4.73	Strongly significant
2	Weather	141	4.70	Strongly significant
3	Gang size	140	4.67	Strongly significant
4	Enabling environment	138	4.60	Strongly significant
5	Height of work	138	4.60	Strongly significant
6	Worker innate ability-his physical and mental energy.	136	4.53	Strongly significant
7	Incentives	133	4.43	Significant
8	Low wage level	133	4.43	Significant
9	Degree of supervision	131	4.37	Significant
10	Labour management relations	130	4.33	Significant
11	Adaptability to and liking 0f the job	129	4.30	Significant
12	Organisation of the spirit of emulation in production	129	4.30	Significant
13	Composition (age, sex, skill and training) of the work force	129	4.27	Significant
14	Construction methods	128	4.27	Significant
15	Length of work day	126	4.20	Significant
16	Work force	125	4.17	Significant
17	Type, scope, layout and complexity of the project	123	4.10	Significant
18	Social and physiological condition of work	123	4.10	Significant
19	Time frame(percentage completion)	122	4.07	Significant
20	Crew composition	119	3.97	Significant
21	Factors in the employment situation	111	3.70	Significant
22	Temperature	109	3.63	Significant
23	Physical fatigue	106	3.53	Significant
24	Government regulations	104	3.47	Undecided
25	Factors in the life outside the employment situation	103	3.43	Undecided
26	Organisational size and maturity	102	3.40	Undecided
27	Relative humidity	88	2.93	Undecided
28	Wind speed	80	2.67	Undecided
29	Trade union practice	71	2.37	Not significant
30	Others	- _	- _	- _

Source Authors field survey, 2011

Table 3 above on the factors affecting productivity of construction worker revealed that Availability of materials, weather, Gang size, Enabling environment, Height of work and workers innate ability (his physical and mental energy) were strongly significant. Out of thirty (30) factors considered six (6) representing 20% with mean value ranges between 4.53-4.73. It was also revealed that these seventeen factors: incentive, low wage level, degree of supervision, labour management relations, Adaptability to and liking the job, organisation of the spirit of emulation in production, composition (age, sex, skills and training) of the work force, construction methods, length of work day, type scope layout and complexity of the project, social and physiological condition of the work, time frame, percentage (complete) crew composition factors in the employment situations, temperature and physical fatigue were rated as having significant effect on the productivity of construction workers on site. These represent 56.67% of the factors with their mean values ranges from 3.53 – 4.43. While five of the factors, Government regulations, Factors in the life outside employment situation, Organisational size and maturity, Relative humidity and Wind speed were rated as undecided. This represent 16.67 % of the factors considered with mean values range from 2.67-3.47.

However, only one factor, trade union practice was rated no significant representing 3.33% with mean value of 2.37.

Report on case study one (S.E.T.)

Computation of Average Standard Time and Out Put for Block laying at Ground Floor and First Floor School of Environmental Technology Phase II.(225mm hollow block)

i. Ground Floor.

Average = $4.03+\frac{3.97+3.90+3.97+3.94+3.88}{6} = \frac{23.69}{6} = 3.95\text{min}$.

Out Put: there are 8 hours in one working day which is converted to minutes

8x60 = 480minutes/day.

Productivity = $\frac{\text{output}}{\text{Input}} = \frac{480}{3.95} = 122$ blocks/day

ii First Floor.

Average = $\frac{3.95+3.94+3.94+3.96+3.94+3.98}{6} = \frac{23.71}{6} = 3.91\text{min}$

Productivity = $\frac{480}{3.91} = 122$ blocks/day

Average Standard Time and Out Put for Concrete Work (First Suspended Floor Slab and Second Suspended Floor Slab) at School of Environmental Technology phase II

i First Suspended Floor Slab(150mm thick)

Average = $6.09+\frac{6.06+5.99+6.06+6.00+5.98}{6} = \frac{36.18}{6} = 6.03\text{min}$

Productivity = $\frac{480}{6.03} = \frac{79.21}{0.15} = \frac{530.27}{25} = 21\text{m}^2/\text{day}$

ii Second Suspended Floor.

Average = $6.09+\frac{6.01+6.01+6.07+6.10+6.08}{6} = \frac{36.36}{6} = 6.06\text{min}$

Productivity = $480 \over 6.06$ = $\frac{79.21}{0.15} = \frac{528.07}{30} = 18\text{m}^2/\text{day}$

Computation of Average Standard Time and Out Put for Plastering work at Ground Floor And First Floor levels at School of Environmental Technology phase II(13mm thick)

i Ground Floor Level.

Average = $22.50+\frac{22.48+22.53+22.51+22.62+22.24}{6} = \frac{134.88}{6} = 22.48\text{min}$

Productivity = $\frac{480}{22.48} = 21\text{m}^2/\text{day}$

ii First Floor Level

Average = $23.25+\frac{23.61+23.28+23.30+23.16+23.11}{6} = \frac{139.71}{6} = 23.29\text{min}$

Productivity = $\frac{480}{23.29} = 21\text{m}^2/\text{day}$

Report on case study two (S.I.C.T.)

Average Standard Time and output for Block laying at Ground Floor and First Floor School of Information and Communication Technology Phase II. (225mm hollow block)

225mm hollow block

i Ground Floor.

Average = $3.96+\frac{3.98+3.96+3.97+3.99+3.99}{6} = \frac{23.85}{6} = 3.98\text{min}$

Productivity = $\frac{480}{3.98} = 121$ blocks/day

ii First Floor

Average = $4.03+\frac{4.06+4.00+4.03+3.98+4.02}{6} = \frac{24.12}{6} = 4.02\text{min}$

Productivity = $\frac{480}{4.02} = 119$ blocks/day

Concrete work

Computation of Average Standard Time and Out Put for Concrete Work (First Suspended Floor Slab And

Second Suspended Floor Slab) at School of Information and Communication Technology phase II.(175mm thick)

i First Suspended Floor Slab.

Average = $\frac{5.54+5.54+5.54+5.52+5.55+5.57}{6} = \frac{33.26}{6} = 5.54\text{min}$

Productivity = $\frac{480}{5.54} = \frac{86.64}{0.175} = \frac{495.03}{30} = 17\text{m}^2/\text{day}$

ii Second Suspended Floor.

Average = $\frac{5.83+5.82+5.87+5.82+5.82+5.76}{6} = \frac{34.92}{6} = 5.82\text{min}$

Productivity = $\frac{480}{5.82} = \frac{82.47}{0.175} = \frac{417.26}{35} = 13\text{m}^2/\text{day}$

Average Standard Time and Out Put for plastering work at Ground Floor And First Floor levels at School of Information and Communication Technology phase I (13mm)

Plastering work:

i Ground Floor Level.

Average = $\frac{23.78+23.78+23.76+23.75+23.77+23.75}{6} = \frac{142.59}{6} = 23.77\text{min}$

Productivity = $\frac{480}{20\text{m}^2/\text{day}}$.

S.E.T Out Put = $21\text{m}^2/\text{day}$

S.I.C.T Out Put = $+20\text{m}^2/\text{day}$

$2/\ 41\text{m}^2/\text{day} = 21\text{m}^2/\text{day}$

i First Floor Level.

S.E.T Out Put = $21\text{m}^2/\text{day}$

S.I.CT Out Put = $+18\text{m}^2/\text{day}$

$2/39\text{m}^2/\text{day} = 20\text{m}^2/\text{day}$

Computation of Average Productivity output for the two construction sites.

i Ground Floor

S.E.T Out Put = 122 blocks/day

S.I.C.T Out Put = +121 blocks/day

2/ 243 blocks/day = 122 blocks/day

ii First Floor.

S.E.T Out Put = 122 blocks/day

S.I.CT Out Put = +122 blocks/day

2/241 blocks/day = 121 blocks/day

Average Productivity output for the two construction sites.

i First Suspended Floor Slab.

S.E.T Out Put = 21m^2concrete slab/day

S.I.C.T Out Put = $+17\text{m}^2$concrete slab/day

2/ 38m^2 concrete slab/day = 19m^2concrete slab/day

ii Second Suspended Floor Slab.

S.E.T Out Put = 18m^2concrete slab/day

S.I.CT Out Put = $+13\text{m}^2$concrete slab/day

$2/31\text{m}^2$concrete slab/day = 16m^2concrete slab/day

Computation of Average *Productivity* output for the two construction sites.

i. First Floor Level.

Average = $\frac{26.45+26.51+26.51+26.43+26.42+26.44}{6} = \frac{158.76}{6} = 26.46\text{min}$

Productivity = $\frac{480}{26.46} = 18\text{m}^2/\text{day}$

Research established (computed) masonry output at ground and first floors

Table 4. Output at Ground Floor (average output of the three activities at the ground floor)

S/No	Blocklaying (m^2/day (225mm block)	Concrete work (m^2/day) (150mm-175mm thick)	Plastering (m^2/day) (13mm thick)	Height
1.	12.15	18.75	20.50	3.00
2.	12.15	18.75	20.50	3.00
3.	12.35	18.75	20.50	3.00
4.	12.25	19.00	20.50	3.00
5.	12.25	18.50	20.50	3.00
6.	12.35	18.50	20.50	3.00
Average	$12m^2$	$19m^2$	$21m^2$	3.00

Source: Author's field study, (2011).

The table 4. above shows that the average output for blocklaying at ground floor is 12m2 while that of concrete work 150-175mm thick is $19m^2$ and the plastering is $21m^2$ at the height of 3.0m.

Table 5. Output at First (average output of the three activities at the first floor)

S/No	Blocklaying (m^2/day) (225mm block)	Concrete work (m^2/day) (150mm-175mm thick)	Plastering (m^2/day) (13mm)	Height
1.	12.25	15.50	19.50	6.15
2.	12.15	15.50	19.00	6.15
3.	12.25	15.50	19.00	6.15
4.	12.15	15.50	19.50	6.15
5.	12.35	15.50	19.50	6.15
6.	12.15	15.50	19.50	6.15
Average	$12m^2$	$16m^2$	$19m^2$	

Source: Author's field study, (2011).

The table 5. Above shows that the average output for blocklaying at ground floor is 12m2 while that of concrete work 150-175mm thick is $16m^2$ and the plastering is $19m^2$ at the height of 6.15m.

Table 6. Student independent T-test result

Analysis. No	Mean Value		Variables tested	Observations				Inferences	
	X_1	X_2		T cal	T tab	P value	Los	Remark	Action on Hypothesis
1	$1.1951x10^3$	$1.1918x10^3$	Block work ground floor. Block work first floor.	0.674	2.228	1.000	0.05	N.S.D	Accept
2	18.7083	15.000	Concrete work first suspended floor Concrete work 2nd suspended floor	8.927	0.041	0.041	0.05	S.S.D	Reject
3	2050	19.3333	Plastering ground floor Plastering first floor	11.068	0.000	0.000	0.05	S.S.D	Reject

Source: Author's field study, (2011).

The table 6. above shows the block work output with a mean values of 1.1951×10^3 and $1.918 \times 10,^3$ at the first floor and ground floor respectively. The values of T calculated is 0.674 which is less than the T tabulated values of 2.228, while P values 1.000 observed is greater than 0.05. This implies that there is no statistically significant difference between the output at the ground floor level and block laying output at first floor level. This might likely be affected by additional labourers engaged in transporting blocks to the first floor.

Under concrete work, (suspended floor slab), the observed output values at ground floor is 18.7083 and that of the first floor is 15.000, the value of T calculated was 8.927 which was greater than the T tabulated value of 0.042, which indicated that there is statistically significant difference between the output of concrete work

(suspended floor slab) at first and second suspended floor slabs.
For plastering work (external wall), the observed mean value outputs are 20.50 and 19.333 at ground and first floor respectively. The value of T calculated is 11.068 which is greater than T tabulated value of 2.228. While the P value of 0.000 was less than 0.05 which shows a statistically significant difference between the output at ground floor level and the output at first floor level.

5.0 Discussion of findings
Rating of the factors affecting productivity of construction workers on site revealed that six factors representing 20% were strongly significant. This includes: Availability of materials, Weather, Gang size, Enabling environment, Height of work and Workers innate ability. With their mean value ranging from 4.73 to 4.53, while seventeen factors out of thirty representing 56.67% were rated significant with mean values ranging from 3.53 to 4.43. The first three of these seventeen factors were incentives, low wages level and degree of supervision with mean values ranging from 4.37 to 4.43 while the last three factors are: Employment situation, Temperature and Physical fatigue with mean values ranging from 3.53-3.70.
The average output of a gang of mason at ground floor level was $12m^2$ (120 blocks per day). The first floor level average output corroborated with Consol's (2010). However, the average output of $12m^2$ might be due to additional labourers' employed to lift blocks to first floor.
This agreed with Butler (1997) that a worker of fast skilled performance of necessary qualified and accuracy can lay 105 to 125 blocks per day.
Secondly, the average output of a gang of masons for casting concrete at the ground floor level (3.0m high) was $19m^2$ of 150-175mm thick while that of second floor level (6.15m high) was $16m^2$. This agrees with Consol's (2010) recommended output$16m^2$ per day at first floor level.
Thirdly, average output for plastering at ground floor level was $21m^2$ per day while that of the second floor level (of 6.15m high) was $11m^2$ per day. This agreed with the range of $18m^2$ per day established by Consol's (2010)
T-test result revealed that there was no statistically significant difference between output at the ground floor and first floor level for block laying. This might likely be affected by labourers engaged in transporting blocks to the first floor.
Further findings indicated that there i statistically significant difference between the output of concrete (suspended slab) at the first floor and the second floor level.
Lastly, the study showed that there is a statistically significant difference between the output at ground floor and the first floor level for external wall plastering

6.0 Conclusion
It is concluded that, 6 factors out of 30 were identified as the major factors affecting masonry productivity which are: Availability of materials, Weather, Gang size, Enabling environment, Height of work and Worker's innate ability (Physical and mental energy). These factors have strongly significant effect on the productivity of masonry workers output on construction sites.
There is no statistically significant difference between the output of block laying at ground floor level and first floor levels, but more labourers were employed at first floor which means work is more costly as the height increases.
A statistically significant differences existed between the output of concrete work at first suspended floor slab and second suspended floor slab.
The research also concluded that the output for Block laying is $12m^2$/day at both ground and first floor while that of Concrete work is$19m^2$ /day and $16m^2$ /day at first suspended and 2^{nd} suspended floors respectively. The output for external wall plastering is $21m^{2/}$day and $18m^2$/day for ground and first floors respectively.

7.0 Recommendations
Based on the conclusion, the following recommendations are made:
1. It is recommended that the result of this research findings should be use to provide information upon which planning, scheduling and cost control of block laying, plastering and concrete works can be carried out.
2. All those factors having strongly significance and significance effects be given greater attention when managed and manipulated to improve worker's productivity.
3. An extension of the study should be made to other building trades using the same methodology adapted in this research study.
4. The bench mark set by this research study should be incorporated into Nigeria building price books and zonal rates.

References
Alinaitive, H.M.,Mwakali, J.A. and Hansson, A. (2007). Factors affecting the productivity of building craftsmen

studies of Uganda. *Journal of civil Engineering* 7(3), 169-176.
BamisIle, A. (2004). *Building production management*. First edition: Lagos, Foresight press Ltd. Lagos.
Butler, T.J. (1970). *Element of administration for Building students*. London: Hutchinson education Ltd.
Consol's Nigeria-Building Price Book for Builders and Developers (2010). Fourth Edition. Pp30
Encyclopaedia Britannica for Students (2010). Home Edition
Hendrickson, C. (2003). *Project Management for Construction, Fundamental Concept For Owners, Engineers, Architects and Builders,* Printed by Prentice hall. Pp 29-30
Khanna, R.B. (2007). *Production and Operation Management*. Asokek. Ghosh New Delhi. Pp 105-109.
Morenikeji, W. (2006). *Research and analytical Methods: for social scientists, planners and environmentalists,* Jos: Jos University press.
Moselhi, O. (2010). Analyses of Labour Productivity of Form Work Operation in Building Construction. *Construction Innovation Information, Process Management,* Canada 7(10), 286-303
Odusami, K.T. and Unoma, G. (2011). Tackling the shortage of construction skills in Nigeria. *Being a Paper Presented at a 2-day National seminar organised by the Nigeria Institute of Quantity Surveyors, vision 20-2020, strategic industry development within National Development Goals in Abuja*. Pp7
Olomolaiye, P.O. (1990). An Evaluation of the Relationship between Bricklayer's motivation and productivity. *Construction management and economics*. 5(3) 8-18
Olomolaiye, P.O. and Ogunlana, S.O. (1989). An evaluation of Production output of Key Building trades in Nigeria*, Construction management and economics.* 7(4), 75-86.
Oxley, R. & Poskitt, J. (1996). *Management Techniques applied to the construction Industry*: Fourth Edition, Collins professional and Technical Books Ltd, Great Britain. Pp 110- 119
Oxley, R. and Poskitt, J. (2007). *Management Techniques applied to the construction Industry*. Fifth Edition, Great Britain:, Blackwell Science Ltd,
Thomas, H. R. (1991). Labour Productivity and work sampling. The Bottom Line. *Journal of construction engineering and management*, 7 (10), 5-11 -529
Thomas, H. R. and Itorner, R. M. (1990) Modelling construction Labour Productivity. *Journal of construction engineering and management*. 23 (6) 148-156

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