

Investigation Of The Factors Affecting Craftsmen Productivity In The Building And Construction Industry In Rivers State, Nigeria

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Abstract

The purpose of this study is to identify the factors and determine the extent to which they affect craftsmen productivity in Rivers State, Nigeria. To achieve this, a total of 125 questionnaires out of a population target of 182 were distributed to stakeholders in the building industry in all the 23 LGAs of Rivers State to randomly sample their opinions on the subject matter. Out of this, 100 were returned, while 90 were valid. The respondents' opinions were rated with a Likert scale while the RII was used to rank the 40 factors that affect craftsmen productivity. Z-score was used to test the hypothesis and reliability of the ranking for significance and non-significance at 5% confidence level. Results showed that the 10 highest ranked factors are; lack of materials, lack of tools/equipment, low wage, lack of experience late, irregular payments, faulty equipment, poor power/water supply, late materials delivery, poor planning and illegal community fees, while the lowest 10 ranked factors are; inspection delay, poor construction method, reworks, no incentive, crew size inefficiency, poor safety training, absenteeism, Government laws, worker retention policy, age and alcoholism. However, illegal fees ('marching ground') are a major challenge in Port Harcourt metropolis and some LGAs: Ogba/Egbema/Ndoni, Khana, Gokana, Ikwerre, Okrika and Eleme. The z-score showed that the non-significant factors are: poor construction method, labour disputes, inspection delays, reworks, no incentives like lunch, crew size inefficiency, poor training on safety rules, absenteeism, age and alcoholism and drug abuse, while the other 25 are significant factors. Efficient resource management/job planning, effective skill development strategy through practical oriented technical and vocational programmes, enhanced motivation, adequate safety training mechanism and government provision of adequate security are amongst the recommended solutions to improve craftsmen productivity in Rivers State.

Keywords: *Craftsmen productivity, Resource factors, manpower, motivation, Relative Importance Index, Significance and Non-significance*

Introduction

The construction industry occupies a strategic position in the national economy as it provides infrastructural development and shelter for continuous economic growth of both the developed and developing nations (Ofori, 2000). The role of the sector is very important and cannot be underestimated because of its output and the socio-economic development such as shelter, infrastructure, employment and huge revenue generation (Usman et al., 2012). In a report released by The Economic Intelligence Group, Access Bank Plc., (2021), The National Bureau of Statistics (NBS) stated that the total market size of the Nigerian construction industry is approximately N11.64 trillion as at 2020. However, in 2021, NBS, (2021) reported that construction accounted for 10.17% and 8.74% to Nigeria's nominal GDP in the 1Q and 2Q of 2021 respectively. Whilst construction services are demanded by both the Government and private individuals, the government remains the major driver of its demand as it tries to close the infrastructure deficit which is 40% of the GDP, to meet the international benchmark of 70% of the GDP (The Economic Intelligence Group, Access Bank Plc., 2021). Private investors are also key players boosting the supply of construction services. It is against this backdrop that key players are concerned about the decreased productivity associated with time and cost overruns, delays, disputes and abandonment of the project (Kurshi and Lawal, 2014).

In defining the concept of productivity, The U.S. Bureau of Labor Statistics (2021) stated that labour productivity is the ratio between a volume measure of output (GDP or gross value added) and a measure of input use (the total number of hours worked or total employment) otherwise stated as the units of work produced per man-hour. However, low productivity of the craftsmen has been identified as one of the most daunting challenges in the construction industry of developing nations like Nigeria (Fagbenle et al, 2011). This is because, craftsmen are people who directly apply their skills and ingenuity on construction work (mason, carpentry, GMP Aluminum doors and windows fixing, metal-welding and fabrications, plumbing etc.) and all together produces complete building structure. Consequently, there is growing interest in productivity research especially as craftsmen play a very essential role to the development of the construction sector. Several factors affect the productivity of craftsmen in Nigeria, Enshassi et al. (2007) observed that, despite intensive investigations into these factors, researchers have not agreed on a universal set or classification of such factors. However, most authors have grouped the factors into: manpower such as lack of experienced craftsmen, design complexity, etc. (Kurshi and Lawal, 2014), management; poor job planning, supervision, labour disputes, etc. (Chigara and Moyo, 2014) motivation; low wage, delayed payment, etc. (Solomon et al, 2012), materials/tools; lack of materials, dysfunctional tools and equipment, etc.(Alinaitwe et al, 2007) safety; accidents and injuries (Sanders and Thomas, 1991) and external factors. Interestingly, Adamu et al., (2011) identified 10 productivity-influencing factors amongst the local construction firms in the North-East of Nigeria: lack of materials, lack of tools, low wage levels, instruction delays, supervisory incompetence, unsafe environment etc. However, factors vary in different countries mainly due to their unique characteristics. In support of this, Polatand Arditi, (2005) discovered contractors in developing countries stock excess materials as the need arises, while in developed countries it is delivered in time or expectation. Construction in developed countries is mostly capital-intensive, while in developing countries like Nigeria, it is labour-intensive. For the purpose of this research, the study identifies the critical factors affecting craftsmen productivity in Rivers State. In doing this and filling the gap of literature, new factors which ultimately affect craftsmen productivity as a result of the peculiar characteristics of Rivers state are discovered and appropriate solution proffered to mitigate these factors and improve productivity.

Research questions

The following research questions have been put forward to achieve the objectives of this study;

1. What factors affect the productivity of craftsmen in the building industry in Rivers State?
2. To what extent do these factors affect craftsmen productivity?
3. What measures can be adopted to mitigate these factors to improve productivity?

Research hypothesis

To validate the accuracy and reliability of the factors affecting craftsmen productivity, the following hypotheses have been stated: P_o is the proportion of respondents who said that the factor affecting craftsmen productivity is significant or non-significant

1. Therefore, Null hypothesis $H_o: P_o = 0.50$ ----- (I)
2. Alternative hypothesis $H_1: P_o \neq 0.50$ ----- (II)

Area of study

This study was carried out in the eight LGAs that form the Greater Port Harcourt City Development Authority (GPHDA) in Rivers State. They are: Port Harcourt (Port Harcourt City (4.8571⁰N, 7.0313⁰E) and Obio/Akpor(4.8864⁰N, 7.0001⁰E) LGAs), Ikwerre (4.9546⁰N, 7.0209⁰E), Eleme (4.7996⁰N, 7.1214⁰E), Oyibo (4.88659⁰N, 7.1245⁰E), Etche (5.1343⁰N, 7.1419⁰E), Ogu/Bolo (4.7229⁰N, 7.2000⁰E) and Okrika (4.7543⁰N, 7.0772⁰E).

Other 15 LGAs are; Ahoada East (5.0835⁰N, 6.6544⁰E), Ahoada West (5.0439⁰N, 6.5136⁰E), Abua/Odual (4.9570⁰N, 6.6310⁰E), Ogba/Egbema/Ndoni(5.3427⁰N, 6.6807⁰E), Emohua (4.8844⁰N, 6.8637⁰E), Asari Toru (4.7400⁰N, 6.8622⁰E), Akuku Toru (4.7299⁰N, 6.7711⁰E), Degema (4.7936⁰N, 6.7771⁰E), Khana (4.6575⁰N, 7.3784⁰E), Gokana (4.6333⁰N, 7.2729⁰E), Tai (4.6827⁰N, 7.3530⁰N), Opobo/Nkoro (4.5141⁰N, 7.5395⁰E), Andoni (4.4820⁰N, 7.4158⁰E), Bonny (4.4293⁰N, 7.1944⁰E) and OmumaLGA (5.0892⁰N, 7.2291⁰E). The perceptions of the respondents were aggregated from these LGAs. The study focused on the urban and semi-urban areas of high urbanization and infrastructural development. The total population of Rivers State is 6,688,576 which is the 2014 projection (NPC Census 2006 and projection).

Research methodology

In this chapter the researcher focuses on the description of the design and procedure employed in sourcing data, mode of data collection, sampling design and mode of data analysis.

Method of data collection

The researcher adopted the survey design method which employed the questionnaire to determine the opinions, preferences, attitudes and perceptions of the respondents on factors affecting craftsmen productivity. Target population of 182 which consists of building contractors/Project managers Civil engineers/Builders, Architects and Craftsmen were selected from the 25 local and foreign construction companies in Rivers State with, at least eight years' experience. The sample size of 125 was used and questionnaires distributed amongst these building practitioners in the selected urban/semi-urban areas of Rivers State. To a considerable extent, straight and unambiguous questionnaire and oral interviews were tailored appropriately to the research topic.

Using the population reduction formulas of Taro Yamane

Assuming a confidence level of 95%

$$n = \frac{N}{1+N(e^2)} \text{ ----- (I)}$$

n = Desired sample size N = Population under study = 182 e = Accepted tolerable error of 5%

Hence, $\frac{182}{1+182(0.05^2)} = 125$ A total sample size of 125 was used.

The five point Likert scale as shown in table 1.0.

Table 1.0 Scoring of the Questionnaire response

S/No	Response	Score
1	Strongly Agreed (SA)	5
2	Agreed (A)	4
3	Undecided (U)	3
4	Disagreed (D)	2
5	Strongly Disagreed (SD)	1

Method of data analysis

The information gathered was presented in understandable form in simple percentage formula in tabular form, while data analyses were done with the Statistical Package for Social Science (SPSS 21).

The simple % method is as follows:

$$F = \frac{\text{Number of Respondent (R)} \times 100}{\text{Population Size (N)}} \text{----- (II)}$$

Where **F** = frequency of the respondents **R** = number of respondents **N** = Population size

Secondly, analysis of the data was done by:

- i. Ranking of the factors by the Relative Importance Index (RII), calculated as stated below:

$$RII = \frac{\sum_{k=1}^5 \binom{5}{k} W_k \times n_k}{(A)(N)} \text{----- (III)}$$

Where W_k = score given to each factor by the respondents 1-5, n_k = Response for each score, N = Total response for each factor, A = Highest score (5)

- ii. To ensure reliability of the rating, Z-statistic was used to test the Hypothesis for sample proportion that is significant or non-significant. The z-statistic was used to test the reliability and accuracy of the ranking for significance and non-significance at 5% confidence level

Analyses and presentation

In this chapter, data collated were tabulated, compared and contrasted and analyzed to arrive at intelligible interpretations and logical conclusions. Data collected across the LGAs were analysed by testing their strength against that of their counterparts in other regions to determine the overall ranking.

Data demography

Below is represented the data generated from the questionnaire and interviewed respondents. Out of the 125 questionnaires distributed, a total of 105 entries were returned resulting in a response rate of 84% out of which a total of 15 incomplete questionnaires were invalid and expunged from the data set leaving only 90 completed entries as shown in table 2.0. The data demography including the response rate of all stakeholders is shown in table 3.0. Research has shown that an achievable and acceptable rate is $\geq 75\%$ for interviews and $\geq 65\%$ for self-completed postal questionnaires (Arber, 2001).

Table 2.0: Data of questionnaires sent and received

S/N	No of Questionnaires	No Sent	No Received	Invalid data	No used for study
1		125	105	15	90
2	% of total	100	84	12	72

Research survey: 2021

Table 3.0: The response rate of respondents

S/N	Stakeholders	No of Questionnaires	Respondents	% Respondents
1	Project managers	15	12	80.0
2	Civil Engineers/ Builders	35	30	85.7
3	Architects/Quantity Surveyors	30	25	83.3
4	Craftsmen: Carpenters, Bricklayers, welders etc.	45	38	84.4
Total		125	105	84.0

Research survey: 2021

Data presentation

The factors affecting craftsmen productivity were grouped, A-F and ranked according to their RII. The groups are represented in table 4.0.

Table 4.0: Ranking of the factors under the groups

S/N	Factors	No of Respondents (n _k) for each Score (W _k)					N	RII	Rank
		1	2	3	4	5			
Maximum value						90		1	
A	Resource Factors								
1	Lack of construction Materials	0	1	1	32	56	90	0.918	1
2	Late delivery of materials	5	6	5	36	38	90	0.813	8
3	Lack of tools/equipment	0	1	1	35	53	90	0.911	2
4	Inefficient/faulty Equipment	5	6	4	33	42	90	0.824	6
5	Poor site condition (eg poor topography, erosion or flood)	9	10	4	29	38	90	0.771	13
6	Poor material handling	20	14	3	28	25	90	0.653	27
7	Poor access within site	13	9	38	30	35	90	0.744	15
8	Inadequate transportation facilities	19	16	0	26	28	89	0.663	25
B	Manpower/Technical factors								
9	Lack of experience	4	4	3	31	46	88	0.852	4
10	Reworks	37	11	1	27	14	90	0.533	32
11	Incomplete project drawing	14	10	4	26	36	90	0.733	17
12	Design and Project complexity	15	18	2	28	25	88	0.668	24
13	Poor construction method	27	23	1	10	29	90	0.580	28
14	Design changes	15	16	2	23	34	90	0.700	22
15	Age	45	7	2	32	4	90	0.473	39
16	Crew size inefficiency (alteration of the optimal crew size)	34	15	1	33	7	90	0.520	34
17	Absenteeism	42	11	0	27	10	90	0.493	36
18	Alcoholism and drug abuse	47	4	2	32	3	90	0.471	40

19	No job specification	12	11	3	31	$\frac{3}{3}$	90	0.776	16
C	Managerial factors								
20	Poor project time-control plan	16	12	3	24	$\frac{3}{3}$	88	0.705	21
21	Poor site/job organization	5	8	4	35	$\frac{3}{7}$	89	0.804	9
22	Instruction delays	11	9	3	29	$\frac{3}{8}$	90	0.764	14
23	Poor communication	15	21	1	32	$\frac{2}{2}$	90	0.662	26
24	Poor supervision	5	9	8	30	$\frac{3}{7}$	89	0.775	12
25	Inspection delays	25	27	2	13	$\frac{2}{2}$	89	0.555	30
26	Compliance to government laws	40	14	1	26	8	89	0.483	37
27	Illegal community fees (otherwise called 'marching ground')	8	7	4	33	$\frac{3}{6}$	89	0.786	10
28	Labour disputes with owners/contractors	23	28	2	12	$\frac{2}{5}$	90	0.573	29
D	Motivation								
29	Low wage	1	2	2	38	$\frac{4}{7}$	90	0.884	3
30	No overtime	16	14	4	30	$\frac{2}{6}$	90	0.680	23
31	Late/irregular Payments	2	4	10	34	$\frac{4}{0}$	90	0.836	5
32	Worker retention policy	41	14	0	29	6	90	0.478	38
33	Poor basic facilities/benefits (accommodation, canteen, etc.)	27	29	2	9	$\frac{2}{3}$	90	0.538	31
34	No incentive like Lunch, transport etc.	37	9	2	34	8	90	0.527	33
E	Safety/Security factors								
35	Lack of health and safety rules	13	13	3	27	$\frac{3}{4}$	90	0.724	19
36	Accidents at work	14	11	4	25	$\frac{3}{6}$	90	0.729	18
37	Poor safety training	26	25	4	31	4	90	0.516	35
38	Insecurity (criminality, militancy and insurgency)	15	13	3	24	$\frac{3}{5}$	90	0.713	20
F	Other factors								
39	Harsh Weather condition	7	9	4	36	$\frac{3}{4}$	90	0.780	11
40	Poor power and water supply	6	7	5	27	$\frac{4}{5}$	90	0.818	7

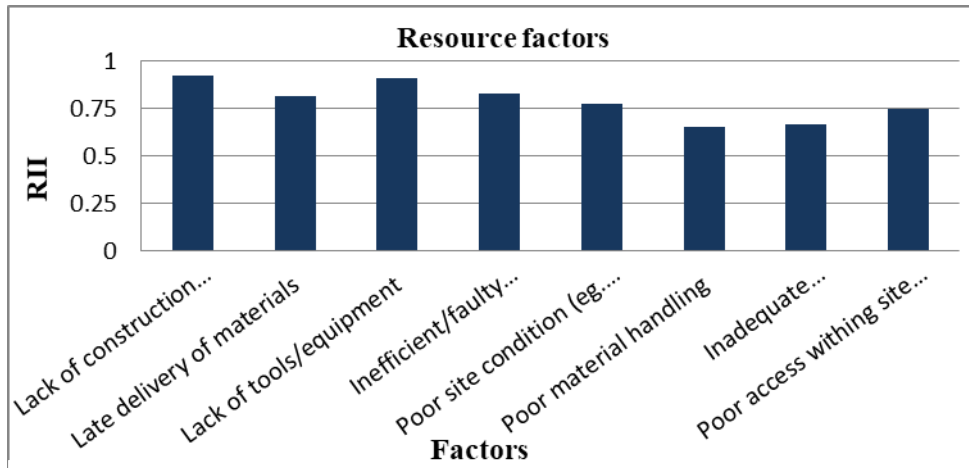
Research survey: 2021

Analyses of the result

The represented data in table 4.0 is discussed under the groupings.

Resource factors

From the results, resource factors are top-rated amongst the whole groups. Fig 4.0 shows the chart representing the Relative Importance Index (RII) of Resource factors. Lack of construction materials, tools/equipment, inefficient/faulty equipment and late delivery of materials are ranked 1st, 2nd, 6th and 8th respectively. The reason for the high positions of lack of materials and tools/equipment is that no activity can be performed without adequate material and functional tools/equipment. This conforms to the findings of Alinaitwe et al, (2007).



1.0: Rumubiakani, Port

Importantly, costs of construction materials are very high especially with the current high inflationary trend in Nigeria. Thus, it is either the materials are not available in the local markets or they arrive late, when actually procured, which keeps craftsmen idle most of the times. The problem is worsened when some of these materials are to be imported. Hence, labor has to be idle till they are provided. Similarly, most indigenous contractors do not have the financial wherewithal to purchase new equipment or even hire, when available, and when they do, they are either the faulty or inefficient ones which further decrease productivity. Poor site condition and poor access within site is ranked 13th and 15th respectively. The reason being that when a site is inaccessible and condition unfavorable, it becomes difficult to work. For example, productivity may be hampered in a flood, swampy site that is not spacious (Gundecha, 2013). In most cases, interference between craftsmen may slow down the work. This is evident in most coastal areas. Poor material-handling rated 27th, also affects craftsmen productivity when there is duplication of efforts, insufficient and double material-handling, which concur with the findings of Chigara and Moyo, (2014). Inadequate transportation facilities like road ranked 25th, affects the movement of workers, materials and equipment to the site thus affecting productivity.

Manpower/technical factors

Results from fig 4.1 and table 4.0 showed that the Manpower/Technical factors are crucial in the craftsmen productivity. Lack of experience is ranked 4th and a major problem which affects productivity and results in poor quality job, high cost or wastage of materials and equipment, and much time-consumption. This result is in tandem with the conclusions of Enshassi et al, (2007) who established that the knowledge/skill/experience of a craftsman enhances productivity and improves the intellectual and physical abilities of labour force.

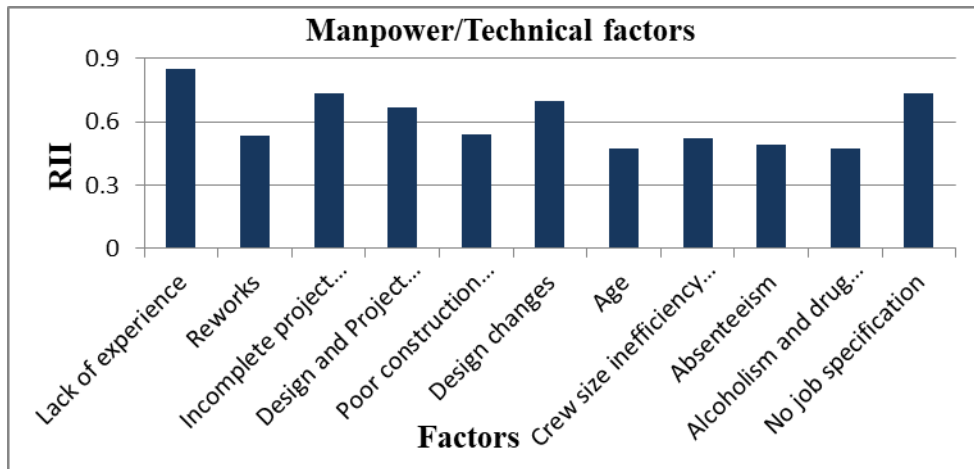


Fig 4.1 Manpower/Technical factors

No job specification, incomplete project drawing and design changes are ranked 16th, 17th and 22nd according to table 4.0. Lack of specification, incomplete project drawing and design changes impede productivity because they cause delays, create room for errors and alterations which results in rework, hence decreasing productivity. This is similar to the findings of Alinaitwe et al, (2007). Poor construction method ranked 28th is due to poor project time, cost and quality-control plan which is a direct result of poor project management, supervision and lack of experience. It affects productivity adversely due to low quality, long-time consumption and high cost of construction. The complexity of a project is ranked 24th and it explains how difficult/advanced it is to analyze the design and execution of a project. There has to be capacity in terms of the level of skill, expertise and experience of the executors of the project. This factor affects productivity in the sense that it takes much time and cost to analyse and accomplish it than a simple design. Rework, ranked 32nd is the rectification or total reconstruction of a poor work done. It is a direct result of lack of job specification, incomplete project drawing and sometime design changes which adversely affect productivity. Alcoholism, ranked 40th, affects the mental and physical ability of the craftsmen which may lead to rework, error or accident, while Age, ranked 39th, affects speed, agility and strength. These factors affect productivity (Datong *et al.*, 2011) but they are not strong factors. Absenteeism, ranked 36th, comes into play when the absence of crew members affects the production rate (Gundecha, 2013). This is connected to crew size inefficiency, ranked 34th, which is the alteration of the optimal crew size. When the crew size is not complete the workers will have to wait for the absent crew member to be available before commencing work thus affecting productivity.

Managerial factors

Managerial factors deal with site management and they are very crucial. The results are shown in fig 4.2 and table 4.0. Poor job organization and poor supervision, ranked 9th and 12th, respectively affect productivity adversely because they increase waiting and idle times of craftsmen. This position is supported by Popescu et al., (2003) that the ability of the foremen to plan, schedule and lay out work affects masonry productivity. Poor job planning and poor supervision causes delays, idleness, poor workmanship, wastage of resources and poor quality job which affect productivity. Instruction delays ranked 14th, keep the workers idle and unproductive because job instruction has not been issued (Zakeri et al., 1996) by the authorities, thus affecting productivity.

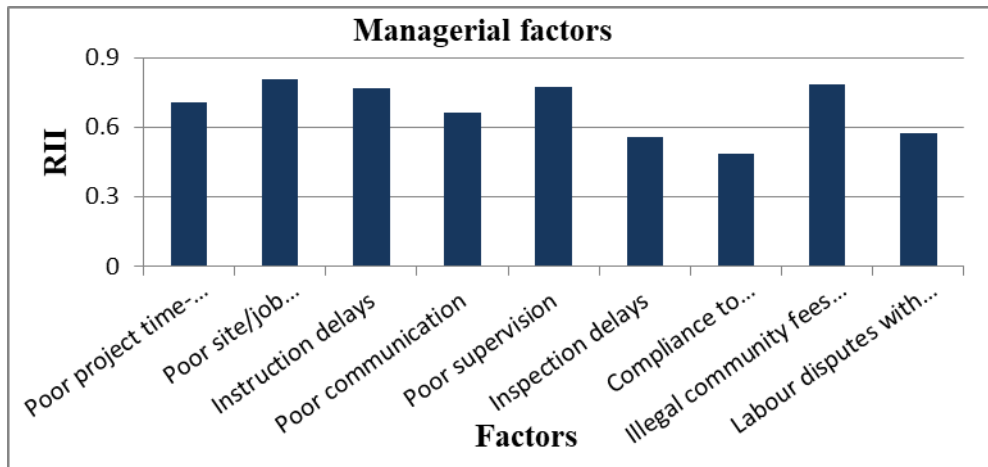


Fig 4.2 Managerial factors

Inspection delays, ranked 30th, involve the certification or approval of job by authorities. So, when this is delayed, workers tend to be weary in waiting before payment is approved and performing another activity, thus, productivity is hampered (Alinaitwe et al, 2007). Poor project time-control plan, ranked 21st, involves the drawing of time-table of activities, sequencing and scheduling of job activities to be performed in the site within project duration to avoid time and cost overruns. This factor affects planning and productivity adversely because when activities are not planned, the workers are left with no direction with hitches and stoppages all the time. Illegal community fees otherwise called 'marching ground' is ranked 10th and it is one major problem affecting craftsmen productivity in Rivers state especially in Obio/Akpor and Port Harcourt City, Khana, Gokana, Tai, and Eleme LGAs. These very high illegal fees collected in an uncivilized manner by community youths, representatives of traditional rulers, criminals, etc. are frustrating. There is absolutely no law backing their actions and security agencies seem to be aloof and indifferent to their activities. During these activities, no work can be done, hence productivity is affected. Labour disputes with owners or contractors, ranked 29th, affect productivity when workers withdraw their services mainly due to poor condition of service. An example was the recent withdrawal of their services by crew members working with Julius Berger Nig. Ltd in Port Harcourt who protested against poor conditions of service. Poor communication, ranked 26th is due to inaccurate instructions passed or misunderstood instruction dished out by the supervisor/site Engineer which results in errors, high cost of construction and low quality. This is largely attributed to the low literacy levels/technical training levels of the craftsman as communication is verbal and face to face. However, this can be eliminated by strict supervision. Poor communication is a serious problem in the hinterlands because of high illiteracy level. Compliance to government laws is ranked 37th. Government through the ministry of works and urban planning may set standard for construction designs and make it a point of duty for contractors to comply with it.

Motivation

Motivation is a way of positively influencing workers or boosting their morale for higher productivity. Thus, people tend to improve in productivity when well-motivated (Solomon et al, 2012) with financial benefits like bonuses, prompt payments, etc., and non-financial benefits; basic social amenities like accommodation, feeding, transport, festive gifts, etc. Low wage is ranked 3rd and very high, because it is a major factor that dampens the morale of workers to the barest minimum. When workers receive low wage they are unhappy.

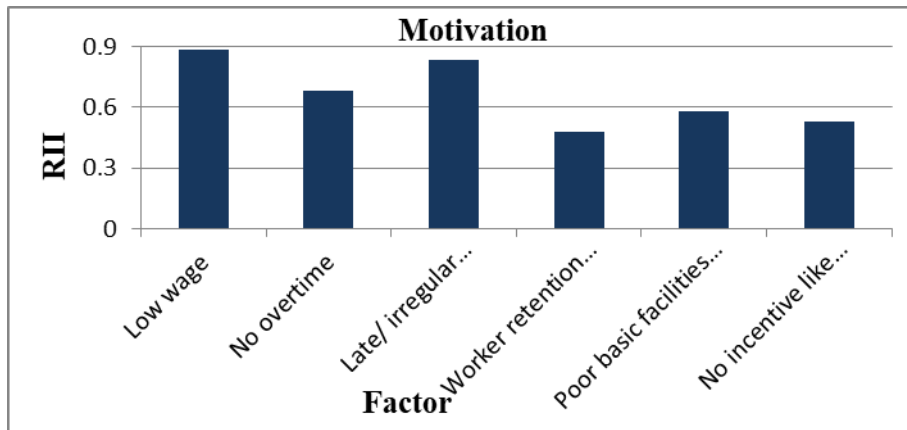


Fig 4.3 Motivation

Aiyetan and Olotuah, (2006) discovered that the most used and preferred motivating factor by craftsmen is increased wage. So, when the wage is low, their morale is dampened and this results in low productivity. Similarly, late or irregular payment ranked 5th, affects productivity seriously because when payment is delayed or irregular, the workers are not happy and this demoralizes them. No overtime is ranked 23rd and this affects productivity because less productive time decreases productivity and vice versa. In all the LGAs, most workers prefer overtime to none because this puts more money into their pockets. No incentive is ranked 33rd. This factor relieves the worker of excess burden on his wage, especially when lunch is subsidized and transport means provided. Thus ‘No incentive’ dampens workers’ morale and lowers productivity. Poor basic facilities/benefits are ranked 31st. They are non-financial benefits workers enjoy such as accommodation, feeding, light, etc. which reduces their costs of living. But when these incentives are not provided, workers are ill-motivated, hence productivity decreases. Workers retention policy, ranked 38th, allows the retention of workers in previous sites for new jobs and this boosts productivity but decreases it when it is not available. But, this factor is not a strong factor as most craftsmen prefer finishing the job and getting engaged in another with a higher pay.

Safety/security factors

Accidents at work, ranked 18th, have the highest impacts on labour productivity under this group as shown in fig 4.4 and table 4.2. Accidents may cause death, incapacitation or life threatening injuries which stop work temporarily, thus lowering productivity (Sanders and Thomas, 1991).

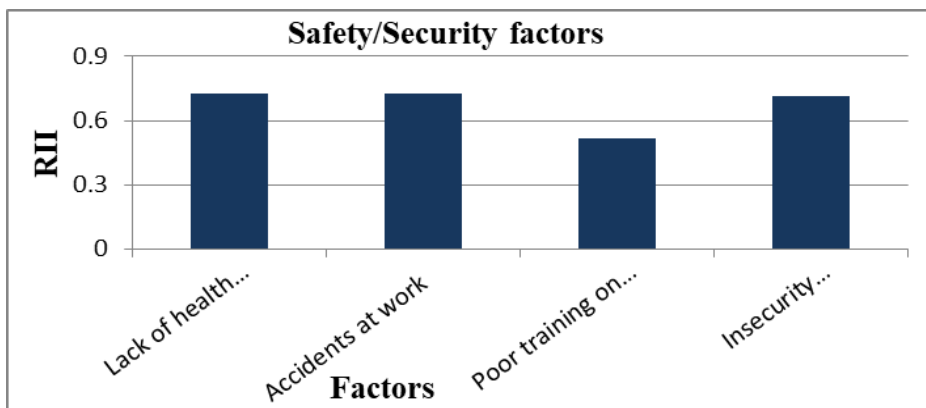


Fig 4.4 Safety/Security factors

Lack of health and safety rules, ranked 19th, is when the rules are not there, so, the workers have nothing guide them, thus exposing them to accident. Even when the safety rules are there, the workers are ignorant of them and are exposed to high risk of accidents because of 'No safety training' thus decreasing productivity. Insecurity (criminality, kidnapping and insurgency), ranked 20th, is a case that is isolated and varies from place to place. For example in the hinterlands: Abua/Odual, parts of Ahoada East and West, Bonny, Ogoni LGAs and Kalabari areas construction work is seriously hampered by criminality. In previous years, when militancy thrived in the Niger Delta, construction works were stalled but with political resolution through the FG Amnesty Programme, normalcy has partially been restored. However, kidnapping and criminality have taken the centre stage now. An example is the kidnapping of a Julius Berger worker in the Trans-Kalabari Road construction recently.

Other factors

These factors may be natural or man-made. For example, harsh weather condition ranked 11th, is a serious factor affecting productivity. Nigeria is in the tropics with dry and wet conditions every year.

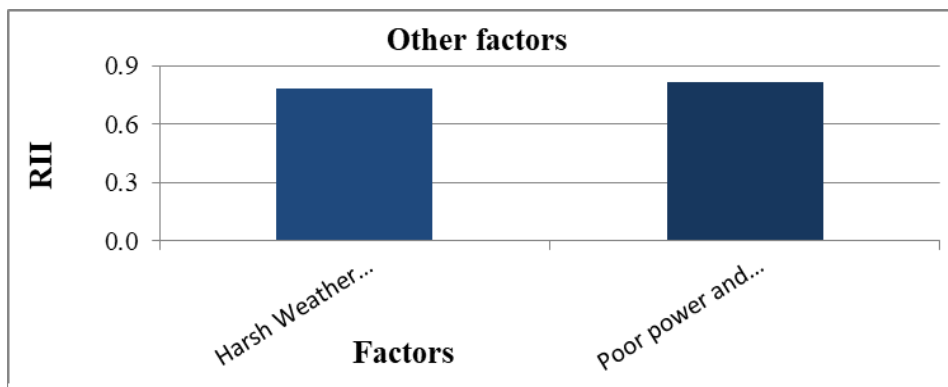


Fig 4.5: Other factors

The temperatures are as high as 38^oC, especially in dry season in the day. The rains in Port Harcourt are always very heavy and frequent. So, weather constitutes a very serious problem affecting productivity. Power and water supply is ranked 7th. Water is an essential element of concrete mixture and so, lack of it affects productivity. In the same vein, power is also very important, especially in welding and fabrication, brazing works in iron fixing, steel roof trusses and joinery, and even in night jobs.

Hypothesis test for the proportion of the sample size

The hypothesis: P_o is the proportion of respondents who said that the factor affecting craftsmen productivity is significant:

- i. \therefore Null hypothesis $H_o: P_o = 0.50$,
- ii. Alternative hypothesis $H_1: P_o \neq 0.50$ (reject null hypothesis)

This is a two-tailed test with Z-values between ± 1.96 at 5% significance level (Nwaogazie, 2006).

$$\text{Z-score, } \therefore Z = \frac{(P_1 - P_o)}{\sigma} \text{----- (IV)}$$

Where P_1 = the sample proportion for each factor. And P_o = the null-hypothesized proportion

σ = Standard deviation. n = sample size

Result interpretation

- i. If $-1.96 < Z < 1.96$, the result is significant at 5%, hence H_o is rejected and H_1 accepted.
- ii. If $-1.96 < Z < 1.96$, the result is not significant at 5%, hence, H_o accepted and H_1 rejected

Table 5.0: Z-score test result

S/ N	Tested Factor	Z-score	Inference	Conclusion
1	Lack of construction Materials	9.2220	Reject H_o & Accept H_1	Highly Significant factor
2	Lack of tools/equipment	9.2220	Reject H_o & Accept H_1	Highly Significant factor
3	Low wage	8.7412	Reject H_o & Accept H_1	Highly Significant factor
4	Lack of experience	7.4841	Reject H_o & Accept H_1	Highly Significant factor
5	Late/irregular Payments	7.2488	Reject H_o & Accept H_1	Highly Significant factor
6	Inefficient/faulty Equipment	6.9013	Reject H_o & Accept H_1	Highly Significant factor
7	Poor power and water supply	6.3994	Reject H_o & Accept H_1	Highly Significant factor
8	Late delivery of materials	6.8333	Reject H_o & Accept H_1	Highly Significant factor
9	Poor site/job organization	6.3994	Reject H_o & Accept H_1	Highly Significant factor
10	Illegal communities fees ('marching ground')	5.8919	Reject H_o & Accept H_1	Highly Significant factor
11	Harsh Weather condition	5.8230	Reject H_o & Accept H_1	Highly Significant factor
12	Poor supervision	5.4554	Reject H_o & Accept H_1	Highly Significant factor
13	Poor site condition (eg poor topography, erosion or flood)	5.1760	Reject H_o & Accept H_1	Highly Significant factor
14	Instruction delays	5.0389	Reject H_o & Accept H_1	Highly Significant factor
15	Poor access within site	4.6101	Reject H_o & Accept H_1	Highly Significant factor
16	No job specification	4.3957	Reject H_o & Accept H_1	Highly Significant factor
17	Incomplete project drawing	4.0976	Reject H_o & Accept H_1	Highly Significant factor
18	Accidents at work	3.8820	Reject H_o & Accept H_1	Significant factor
19	Lack of health and safety rules	3.7524	Reject H_o & Accept H_1	Significant factor
20	Insecurity	3.3235	Reject H_o & Accept H_1	Significant factor
21	Poor project time-control plan	3.1455	Reject H_o & Accept H_1	Significant factor
22	Design changes	2.7716	Reject H_o & Accept H_1	Significant factor

23	No overtime	2.8037	Reject H ₀ & Accept H ₁	Significant factor
24	Design and Project complexity	2.3452	Reject H ₀ & Accept H ₁	Significant factor
25	Inadequate transportation facilities	2.0140	Reject H ₀ & Accept H ₁	Significant factor
26	Poor communication	2.0140	Reject H ₀ & Accept H ₁	Significant factor
27	Poor material handling	2.0370	Reject H ₀ & Accept H ₁	Significant factor
28	Poor construction method	-1.1660	Accept H ₀ & Reject H ₁	Non-significant factor
29	Labour disputes with owners/contractors	-1.4924	Accept H ₀ & Reject H ₁	Non-significant factor
30	Inspection delays	-1.8226	Accept H ₀ & Reject H ₁	Non-significant factor
31	Poor basic facilities/benefits (accommodation, canteen, etc.)	-2.5584	Reject H ₀ & Accept H ₁	Significant factor
32	Reworks	-0.7420	Accept H ₀ & Reject H ₁	Non-significant factor
33	No incentive like Lunch, transport etc.	-0.4264	Accept H ₀ & Reject H ₁	Non-significant factor
34	Crew size inefficiency (alteration of optimal crew size)	-1.5390	Accept H ₀ & Reject H ₁	Non-significant factor
35	Poor training on safety rules	-1.7253	Accept H ₀ & Reject H ₁	Non-significant factor
36	Absenteeism	-1.6865	Accept H ₀ & Reject H ₁	Non-significant factor
37	Compliance to government laws	-2.1320	Reject H ₀ & Accept H ₁	Significant factor
38	Worker retention policy	-2.1082	Reject H ₀ & Accept H ₁	Significant factor
39	Age	-1.7056	Accept H ₀ & Reject H ₁	Non-significant factor
40	Alcoholism and drug abuse	-1.4924	Accept H ₀ & Reject H ₁	Non-significant factor

From table 5.0, the significant factors affect craftsmen productivity significantly while the non-significant factors do not affect craftsmen productivity significantly.

Conclusions

The purpose of this study is to determine the factors affecting craftsmen productivity in Nigeria. To achieve this, a total of 125 questionnaires out of a population target of 182 were distributed to stakeholders in the building industry to randomly sample their opinions on the subject matter. Out of this, 100 were returned while 90 were valid. The respondents' opinions were rated with a Likert scale while the Relative Importance Index (RII) was used to rank the 40 factors that affect craftsmen productivity. Z-score at 5% confidence level was used to test the hypothesis and reliability of the ranking for significance and non-significance. In conclusion, the first 10 noteworthy ranked factors are; lack of materials, lack of tools/equipment, low wage, lack of experience late/irregular payments, faulty equipment, poor power/water supply, late materials delivery, poor planning and illegal community fees, while the lowest 10 ranked factors are; inspection delay, poor construction method, reworks, no incentive, crew size inefficiency, poor safety training, absenteeism, Government laws, worker retention policy, age and alcoholism. Illegal fees otherwise known as 'marching ground' are a major challenge, especially in

Obio/Akpor and Port Harcourt City LGAs. These illegal fees are also practised in Khana, Gokana, Ogba/Egbema/Ndoni (Egi), Okrika and Eleme LGAs.

The z-score showed that the non-significant factors are: poor construction method, labour disputes, inspection delays, reworks, no incentives like lunch, crew size inefficiency, poor training on safety rules, absenteeism, age and alcoholism and drug abuse, while all others are significant factors.

Recommendations

The study recommends the following:

1. Stakeholders in the building industry and government should place high priority on managing the first 10 most important factors mentioned above to enhance productivity.
2. Rivers State Government should establish technical and vocational centres purely on 80% practical and 20% theoretical basis for effective medium level manpower skill acquisition and development by craftsmen. Companies should adopt on-the-spot training for retention to enhance productivity.
3. Project managers should ensure proper supervision, timely instruction passage, adequate health and safety personnel to ensure strict adherence to safety rules in the sites.
4. Contractors should ensure adequate motivating factors are put in place during project execution.
5. Government should ensure that illegal community practices are outlawed and perpetrators arrested and prosecuted to serve as deterrent to others.
6. Clients and contractors should ensure consistency of job specifications and designs, and completeness of project designs to prevent unnecessary errors and rework.
7. Government should provide adequate security in the state to tackle insecurity and enhance productivity.

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